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FIRE SAFETY EVALUATION SYSTEM (FSES) FOR BUSINESS OCCUPANCIES SOFTWARE (ver 1.0 FOR WINDOWS®) USER'S MANUAL

A Windows® implementation of the FSES found in Chapter 7 of NFPA 101A 1995 Edition

Prepared by:
Hughes Associates, Inc.

NIST
National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

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The program is a literal translation of NFPA 101A, *Guide on Alternative Approaches to Life Safety* (1995 ed), FSES for Business Occupancies which is copyrighted by the National Fire Protection Association (NFPA).

Information in this document is subject to change without notice. Illustrations were current at the time this document was published.

Acknowledgements

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Contents

1.0 Overview

This manual is designed to familiarize users with the PC-based Computerized Fire Safety Evaluation System (FSES) for Business Occupancies (Version 1.0). This initial version of the PC-based FSES for Business Occupancies is a direct translation of the methodology contained in NFPA 101A, Guide on Alternative Approaches to Life Safety (1995 ed.), but with user enhancements. Future versions of this program will incorporate specific fire hazard calculation methods and fire risk elements to permit risk/benefit analysis of existing and planned office or business occupancies. Program development was sponsored by the General Services Administration and the National Institute of Standards and Technology's Building and Fire Research Laboratory. The development was performed by Hughes Associates, Inc. under grant from NIST. This effort is part of a broad based technology development program underway at NIST to develop performance/risk based methods for integration of fire protection equivalency into building design and evaluation.

The methodology in this PC-based FSES is intended for use in comparing levels of safety which differ from the specified requirements in the NFPA 101 Life Safety Code. Results are presented in terms of relative equivalence to the Life Safety Code. It is assumed that the user has a working knowledge of both the NFPA 101 Life Safety Code and NFPA 101A. In addition, rudimentary knowledge of the Microsoft Windows™ environment and conventions are required.

1.1 Software Requirements

The PC-based Fire Safety Evaluation System (FSES) Version 1.0 is a self-installing, Windows™ environment computer program. The program is contained on three 3½" diskettes. The following files should be present:

Disk 1

DISK.ID	37	02-20-96
INSTALL.EXE	266,192	02-05-96
FSES.EXE	873,344	06-24-96
INSTALL.DAT	4,238	02-20-96

Disk 2

EXTEXT1.SUS	1,934	04-25-95
EXTEXT2.SUS	1,934	04-25-95
EXTEXT3.SUS	591	04-25-95
F1TEXT.SUS	8,393	02-05-96
F2TEXT.SUS	861	02-05-96
F2ATEXT.SUS	439	04-25-95
F4TEXT.SUS	8,459	05-03-95
F5TEXT.SUS	3,483	05-03-95
F6TEXT.SUS	7,645	04-25-96
F7TEXT.SUS	5,403	02-05-96
F8TEXT.SUS	379	04-21-95
CST.SCR	284	04-22-95
11_20_94	37	05-12-95
HLPTXT1.SUS	8,643	05-03-95
HLPTXT2.SUS	1,735	04-25-95
SAMP001.PRJ	452	05-09-95
MOTTO1.BMP	10,606	05-08-95
LOGO2B.BMP	308,278	05-09-95
HUGHTEXT.BMP	48,550	05-09-95
HUGHMAPS.BMP	106,330	05-09-95
CDFPICS.VBX	36,452	03-22-95
DISK.ID	38	02-20-96
HUGHMAP1.BMP	106,330	05-11-95

Disk 3

FIGURE1.BMP	307,994	03-26-95
FIGURE2.BMP	307,994	03-26-95
FIGURE3.BMP	307,994	03-26-95
LOGO1.BMP	421,558	05-09-95
DISK.ID	36	02-20-96

If any of the files are missing, new disks should be obtained.

1.2 Hardware Requirements

The minimum hardware requirements to install and run FSES Version 1.0 are:

1. **286 or higher IBM-compatible computer.**
2. **Windows™ version 3.1 or higher.**
3. **VGA or higher monitor.**
4. **MS-DOS 3.3 or higher (Windows™ 3.1 implies this).**
5. **At least 2.9 Mb of available hard disk storage.**

The following is optional but useful:

1. **386 or higher IBM-compatible computer.**
2. **Printer supported by Windows™ 3.1 or higher.**
3. **Mouse.**
4. **"Large" Windows™ fonts.**[1]
5. **256 or more color monitor.**

[1]Most screen displays allow the use of small and large fonts. FSES does not self-scale its screens. This is a standard Windows™ practice. As a result, screens are difficult to read in a small font mode.

2.0 Installation

FSES Version 1.0 may be installed either at the MS-DOS prompt or through the Windows™ Program Manager. Before installation, it is good practice to preserve the original program by making backup copies on separate diskettes.

2.1 Windows™ Program Manager Installation

To install FSES through the Windows™ Program Manager:

1. **Start PC and run Windows™.**

2. **Insert FSES Version 1.0 "Installation Diskette 1" into a compatible drive on the computer (Usually drive A or B, depending on your drive configuration).**

3. **In Windows™, with the Program Manager open, select "Run" under the "File" menu. Type in the drive letter, followed by a colon, then type install as shown in Figure 1, then click the mouse on the "OK" button. This will invoke the installation procedure.**

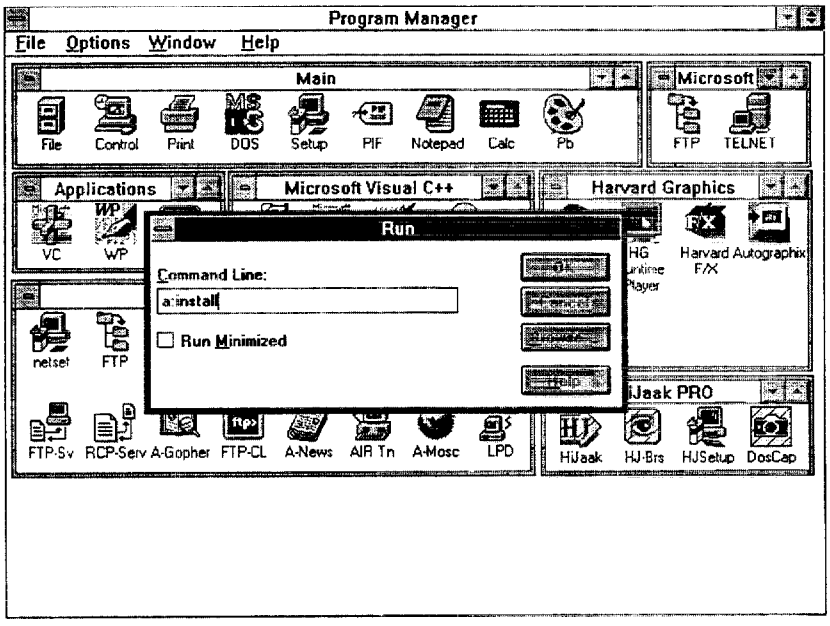

FIGURE 1 RUNNING THE PROGRAM MANAGER "RUN"

The installation routine will first prompt the user for the disk drive that FSES should be installed onto, as shown in Figure 2. All available drives are displayed in a box with the default drive (usually C:) highlighted. The installation will not permit FSES to be installed onto a floppy disk drive and will abort the installation if one is chosen, although they are listed as installation options.

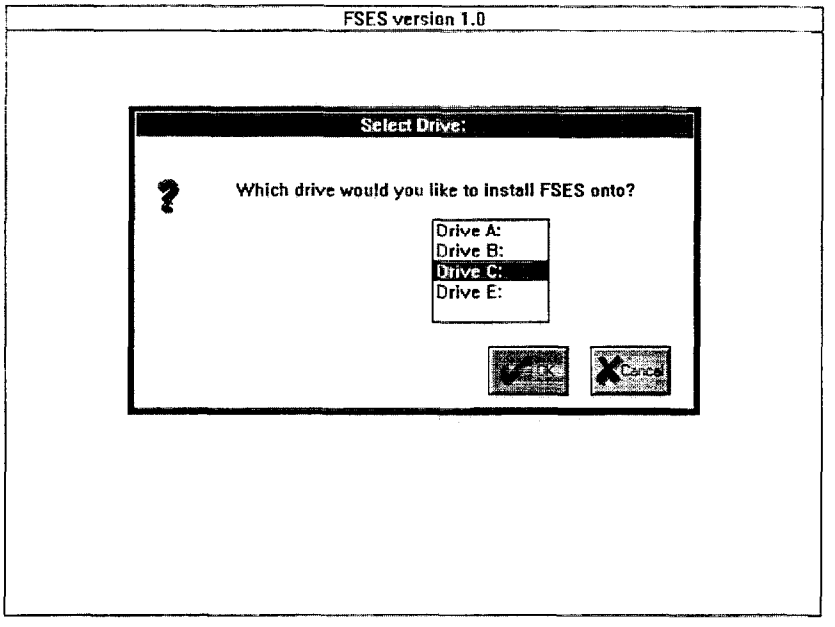

FIGURE 2 SELECTING THE INSTALLATION DRIVE

The installation program will next prompt the user for the subdirectory. Any valid MS-DOS directory name is acceptable. The default directory name is /FSES, as shown in Figure 3.

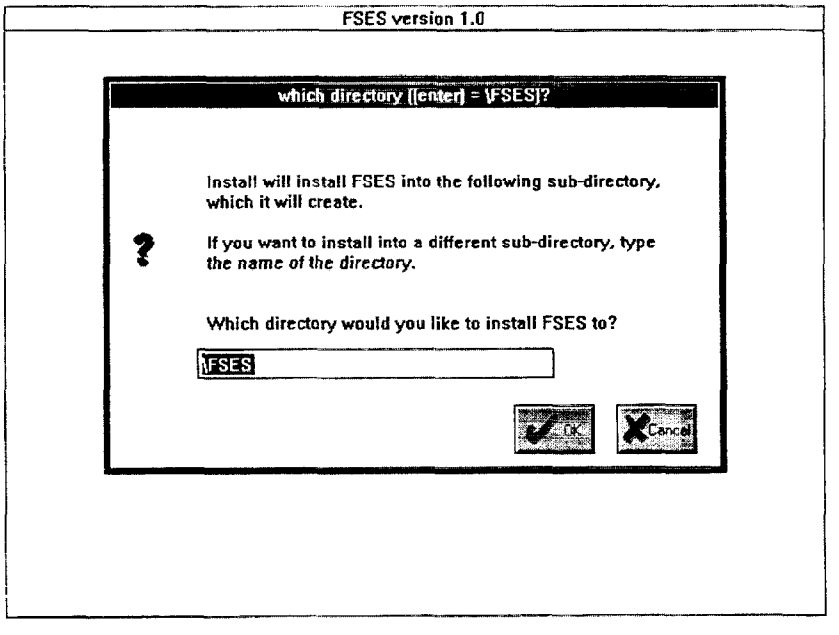

FIGURE 3 NAMING THE INSTALLATION SUB-DIRECTORY

The next two screens (Figures 4 and 5) prompt the installer for the user name and the organization. The user name and the organization name are stored in a DOS file called 11_20_94. These are the default values used in the FSES program during each execution. If the user name and organization are left blank during installation, there are no default values. The original names may be altered by either re-installing the FSES program or by editing the file 11_20_94 and replacing the original names with the updated ones.

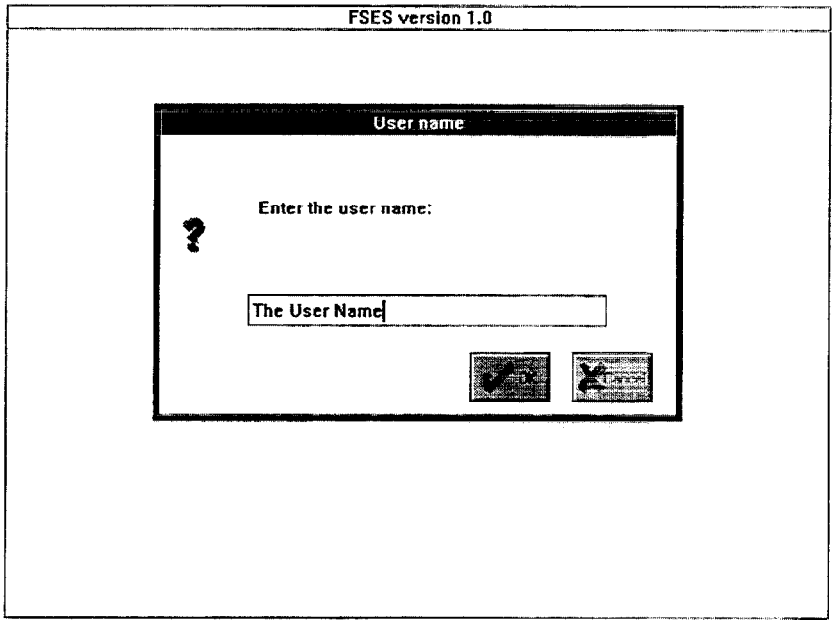

FIGURE 4 ENTERING THE USER NAME DURING INSTALLATION

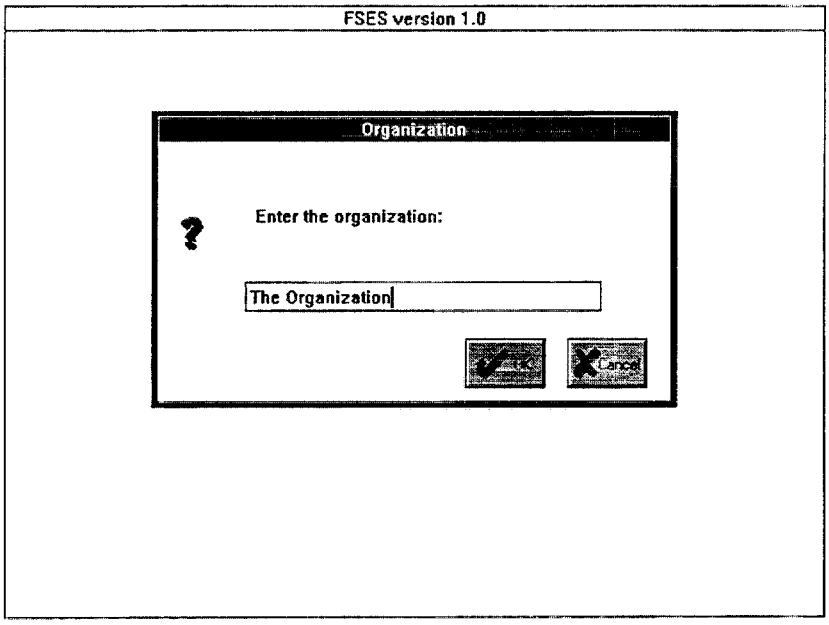

FIGURE 5 ENTERING THE ORGANIZATION DURING INSTALLATION

At this point the transfer of files from the floppy drive to the indicated drive and directory occurs. A window (Figure 6) will appear that indicates the percentage of the installation that is complete and prompt the user to insert the second and third diskettes.

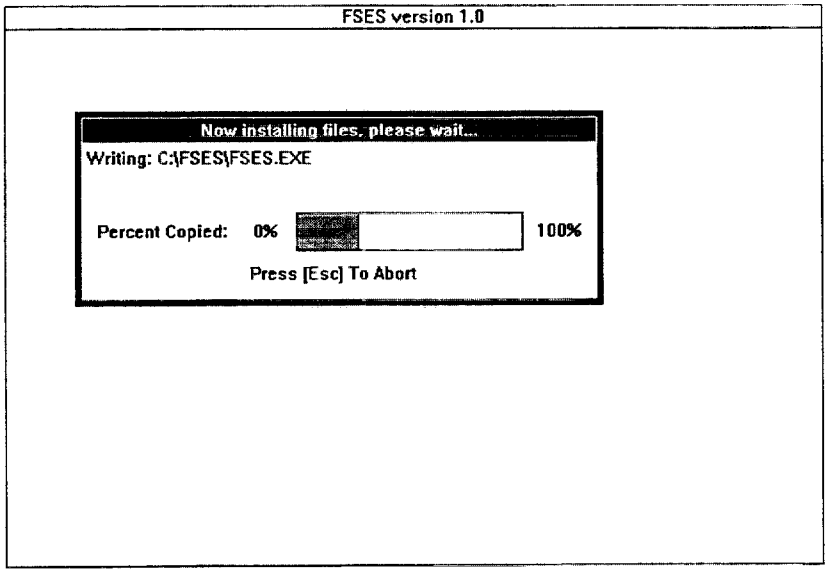

FIGURE 6 INSTALLATION OF THE FSES FILES

When the installation is complete and successful, the program will issue a message to alert the user and return to Windows when the "OK" button is selected (Figure 7). The installation may be aborted at any time by choosing the "Cancel" button (where displayed) or by depressing the "ESC" key.

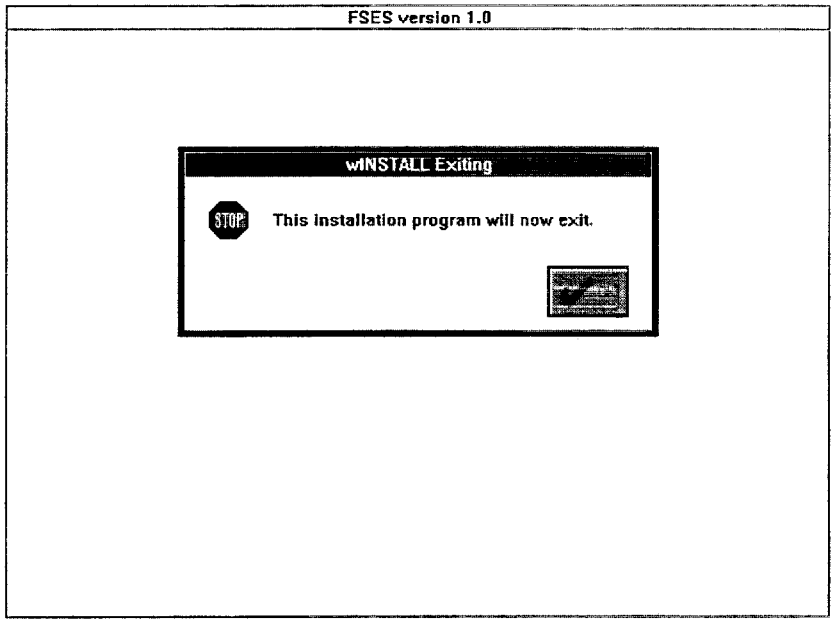

FIGURE 7 SUCCESSFUL INSTALLATION OF FSES

2.2 DOS Installation

Begin installation by inserting the disk "Installations Diskette 1" into a compatible drive on the computer. At the DOS prompt enter:

<diskette drive>:\install

The installation program will search for and run Windows if successful. The installation at this point is identical to the Windows installation procedure described in Section 2.1 after RUN A:INSTALL has been entered.

3.0 Starting FSES

If the installation was successful, the program icon will be located in a Windows Group called FSES similar to the sample shown below in Figure 8.

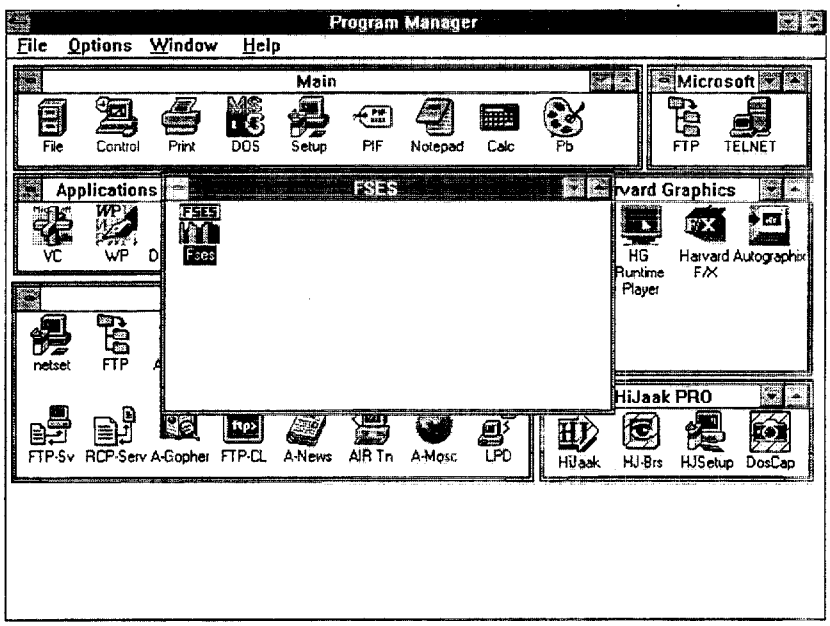

FIGURE 8 FSES WINDOWS GROUP AND ICON

Double clicking on the FSES icon will start the program. Before entering the program, a temporary version screen is displayed for ten seconds. This screen gives a brief description of the computer program and acknowledges the parties involved in its development and acknowledges the NFPA and Microsoft copyrights. Hitting any keyboard button or clicking the mouse will remove the screen at once.

The first screen of the program is the "Version Information" screen (shown in Figure 9). Clicking the "CONTINUE" button will remove this screen and enter the FSES data entry screens.

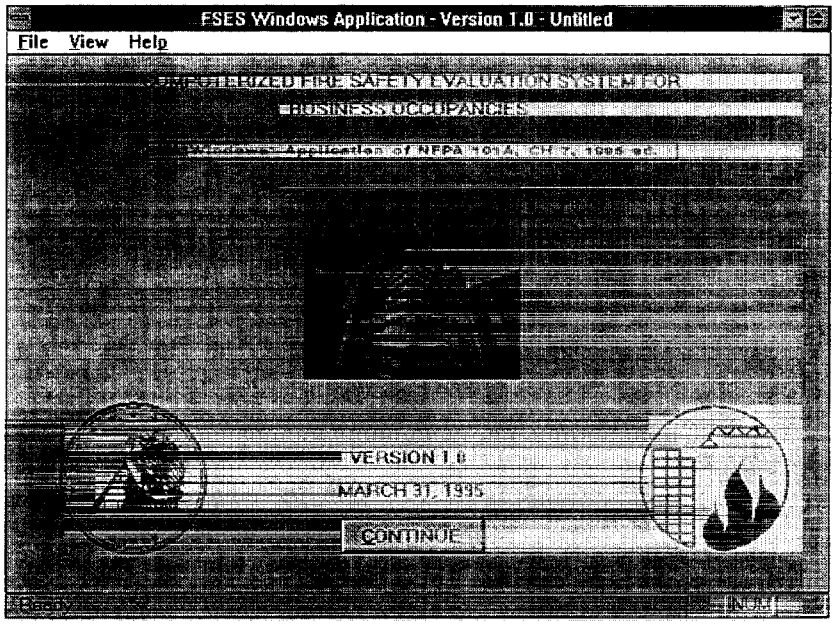

FIGURE 9 FSES VERSION AND DATE SCREEN

4.0 Running FSES

Operation of the FSES program will be illustrated through the use of an example. The example is not intended to be a typical case but rather is selected to highlight as many features of the program as possible. In several instances it is possible to achieve a result via several means. Every attempt is made here to describe these variations. It may be useful at this point to install the program and follow the example described here within the program environment.

4.1 Description of Example

The example described in Section 4.2 is provided with the FSES executable file. It may be loaded by selecting the "File" menu item in the FSES program and choosing "Open...". The example file may be loaded by entering in the file name "SAMP001.PRJ" in the entry box or by double clicking on the file name shown in the lower box.

The example consists of a non-sprinklered two-story building of Ordinary Type II (111) construction. There are smoke detectors but they have neither fire department notification nor a voice communication system. All vertical openings are enclosed and are rated between 30 minutes and one hour. The exit system is exposed, but there are no dead end corridors greater than 50 feet and the maximum travel distance is 75 feet. There is a passive smoke control system implemented and all interior finish has a flame spread rating of 25 or less. The building has a total zone smoke detection system, incomplete corridor/room separation, no occupant emergency program and there are multiple exit routes.

4.2 General Information

The first screen is the "Analysis Information" screen which contains general information. This is shown in Figure 10. The user name and the organization default to the values entered during the installation and the date and the time default to the computer's date and time. All of these fields may be altered by clicking on the field and typing in new information. These fields may be empty.

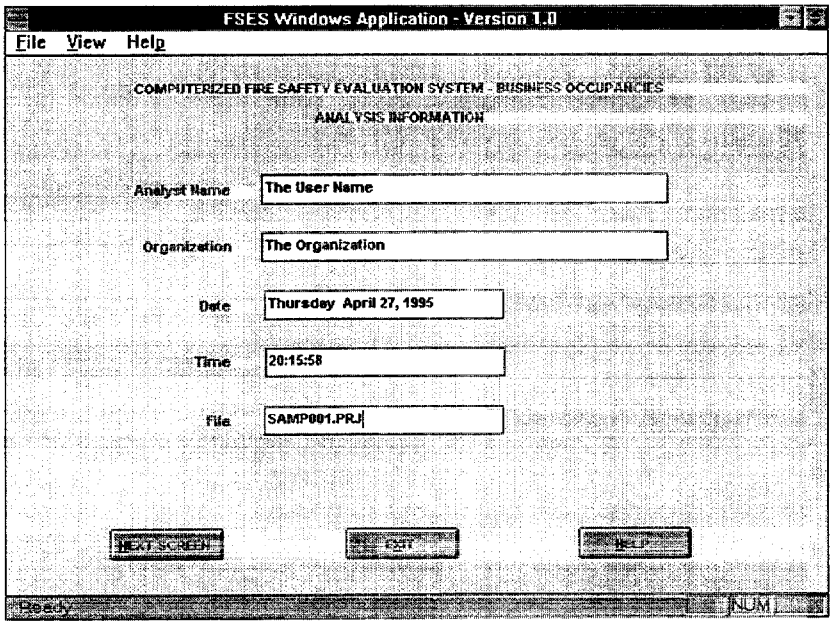

FIGURE 10 "ANALYSIS INFORMATION" SCREEN

The three buttons at the bottom are the main functional features of this screen. Presently, clicking the "HELP" button will flash a message screen informing the user that the help has not yet been implemented (Figure 11). In future enhanced versions of this program, clicking this button will give a description of the options that are available for this screen. This is the case throughout the program.

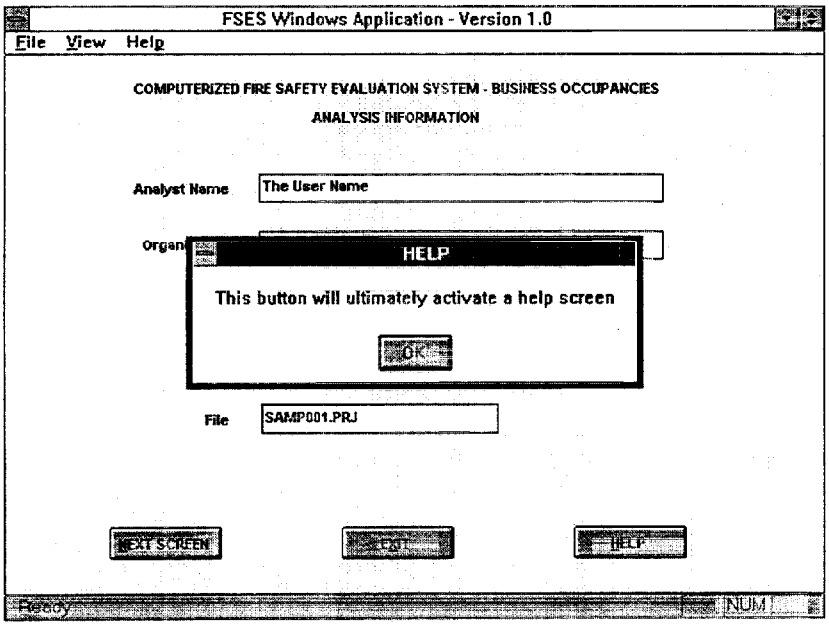

FIGURE 11 "HELP" BUTTON MESSAGE

The "EXIT" button allows the user to exit immediately. If the project is unsaved, the user will be asked if the document should be saved and what to name it. If the name selected already exists, the user will be asked if it should be overwritten. The precautions just mentioned are standard Windows™ procedures.

If the user is satisfied with the data in the screen, clicking the "NEXT SCREEN" button brings up the next screen, "General Building Data", as shown in Figure 12.

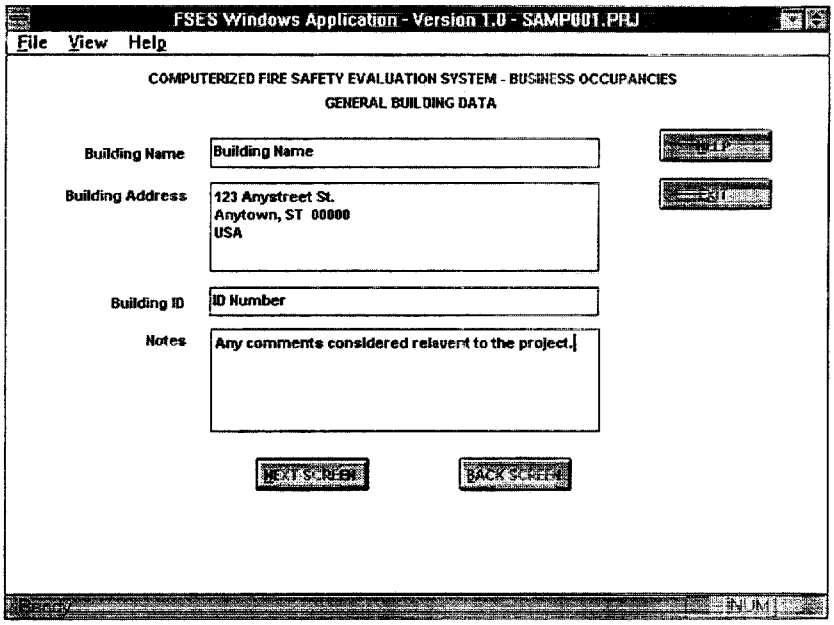

FIGURE 12 "GENERAL BUILDING DATA" SCREEN

The information contained in this screen is used for identification purposes only as with the "Analysis Data" screen. The "HELP" and "EXIT" buttons behave in exactly the same manner as in the "Analysis Data" screen (further mention of these buttons during the review of the example is omitted). The "BACK SCREEN" button returns the user to the "Analysis Data" screen and the "NEXT SCREEN" button proceeds to the next screen in the sequence. The data fields in this screen may also be left blank.

4.2.1 General Building Characteristics

The next screen, "General Building Characteristics - Sheet 1", is the first screen that collects information relative to determining the hazard level of the building. This is shown in Figure 13.

One of the five height options must be selected before moving to the next screen. Clicking on the circle next to the number of stories makes a selection. Selecting another circle or clicking on a selected circle will deselect the option. In the example, the building is a two-story structure.

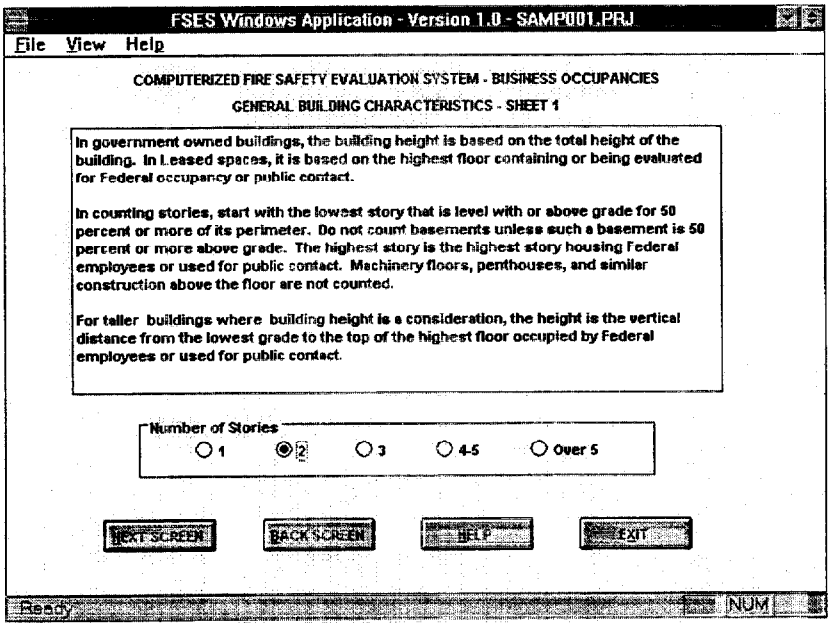

FIGURE 13 "GENERAL BUILDING CHARACTERISTICS - SHEET 1" SCREEN

In the center of the screen is a description of how to determine the number of stories in a building. This includes unusual circumstances such as a leased floor in a multi-story complex. The "BACK SCREEN" button may be selected without selecting the number of stories. However, an error message is displayed if the user attempts to proceed to the next screen without entering a value (Figure 14).

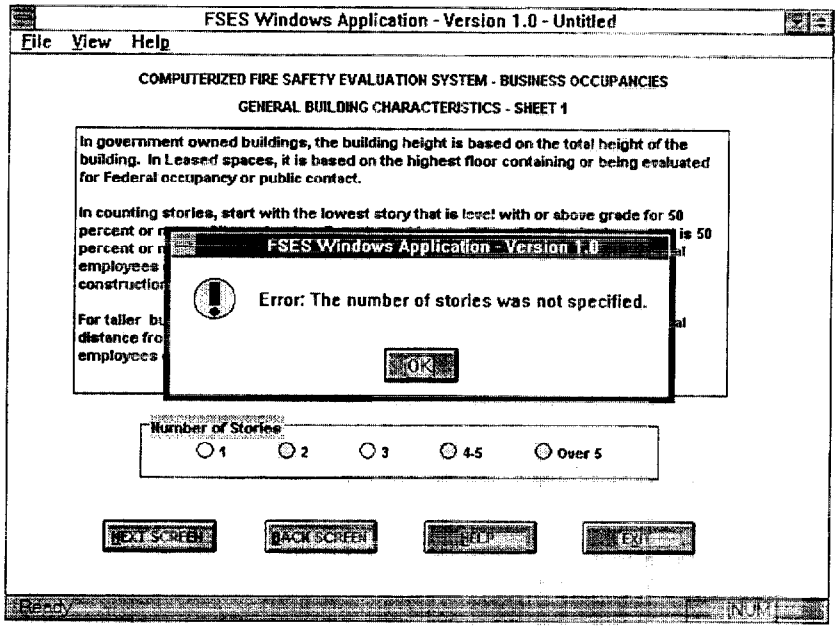

FIGURE 14 ATTEMPTING TO PROCEED WITHOUT SELECTING AN OPTION

When the number of stories has been assessed, clicking "NEXT SCREEN" brings up "General Building Characteristics - Sheet 2". This screen contains the height information and the age classification (new or existing) of the building (Figure 15). In the example, the building is an existing structure that is less than 75 feet tall. As with the number of stories, both the height and new/existing data must be entered to proceed to the next screen. In addition, a warning is displayed if the building is greater than 75 feet and has 3 or less stories. The information in the center of the screen describes how to classify a building as existing or new.

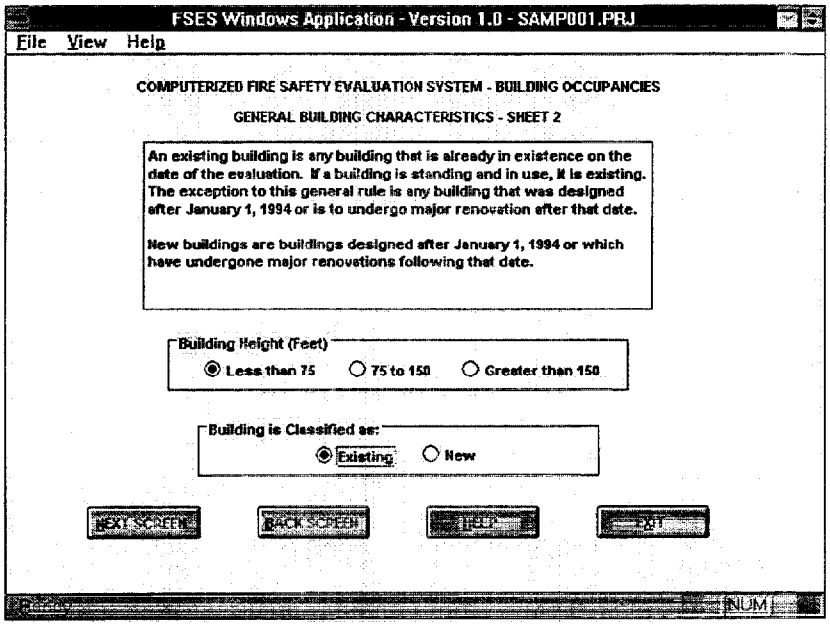

FIGURE 15 "GENERAL BUILDING CHARACTERISTICS - SHEET 2" SCREEN

4.2.2 Main Parameter Screen

When the building height and whether the building is new or existing has been addressed, click the "NEXT SCREEN" button to proceed to the "Main Parameter Screen". This is shown in Figure 16.

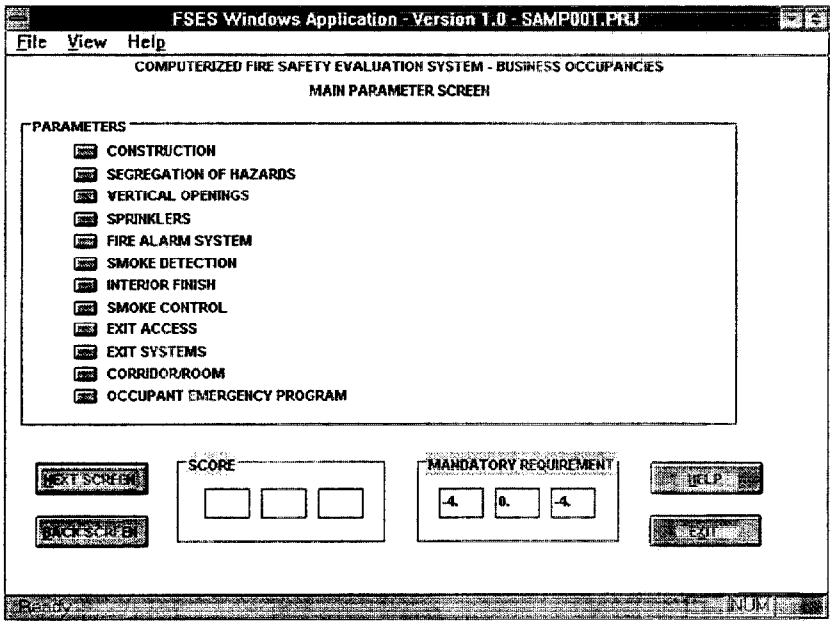

FIGURE 16 "MAIN PARAMETER SCREEN" SCREEN

The "Main Parameter Screen" allows the user to access each of the twelve parameters listed in NFPA 101A for business occupancies. The mandatory score for the building is continuously displayed in the lower right. The building score is shown only when all of the parameters have been assessed. There are several items of note on this screen. First, the mandatory score will only change by changing either the building height, number of stories, or whether the building is new or existing. In general these should not change, however, the user is permitted to do so by clicking the "BACK SCREEN" button. This is currently not advisable because if the construction parameter, the vertical opening parameter, or the exit access parameter have been assessed, changing the building height, the number of stories, or the age classification may result in erroneous scores. Presently a warning screen is displayed before going back a screen informing the user of such consequences and if it is still desirable to proceed. This is shown in Figure 17.

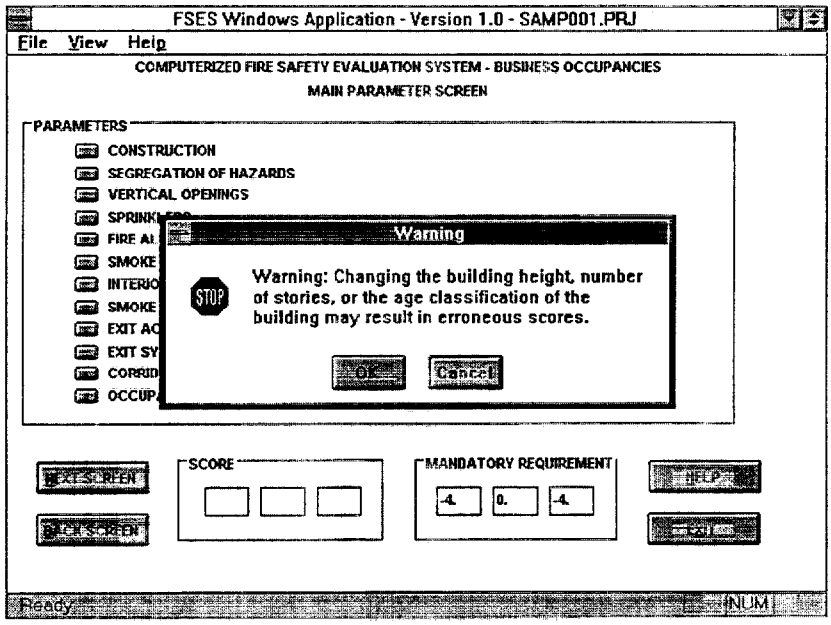

FIGURE 17 USING THE "BACK SCREEN" BUTTON IN THE "MAIN PARAMETER SCREEN"

There are several ways to proceed at this point. Clicking the "NEXT SCREEN" button brings up a screen similar to Table 7-2 in NFPA 101A. This method will be examined in a later section. The second way to address the parameters to click the gray buttons to the left of each parameter. The parameters may be addressed in any order. For convenience, they will be assessed from "Construction" to "Occupant Emergency Program", in the order presented in the "Main Parameter Screen".

4.2.3 Safety Parameter 1, Construction

Selecting the gray button adjacent to "Construction" opens the "Construction Parameter" screen, shown in Figure 18. Only the pertinent information is displayed (The complete chart is contained in NFPA 101A). For the example only the two-story data is displayed.

The user has several options in this screen. The user may select the construction type by clicking the appropriate box. After selecting the construction type several examples will be provided. Additional information about these examples may be obtained by clicking on the example. The user may also get additional information about each construction type by selecting the appropriate construction type and then selecting the "INFORMATION" button. An example of an additional information screen is shown in Figure 19.

Selections may be made in two ways. First, the score value for the desired selection may be double-clicked with the mouse. This will select the score and return the user to the "Main Parameter" screen. Second, the user may highlight the score and then select the "ACCEPT" button, which will return the user to the "Main Parameter" screen.

The "CANCEL" button will return the user to the "Main Parameter" screen without making a selection. The "JUDGEMENT" button will be explained later in this manual, and the "CHOICE GEN" button is currently unused.

For the example, Type II (111) has been selected. Either double-click on the appropriate score value or select the "ACCEPT" button to enter the building type and return to the "Main Parameter" screen.

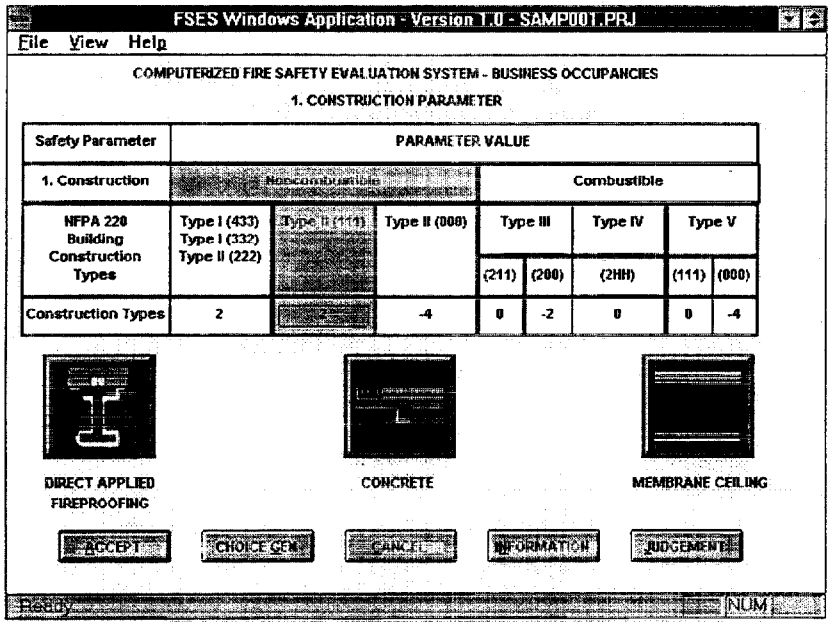

FIGURE 18 SAFETY PARAMETER CONSTRUCTION SCREEN

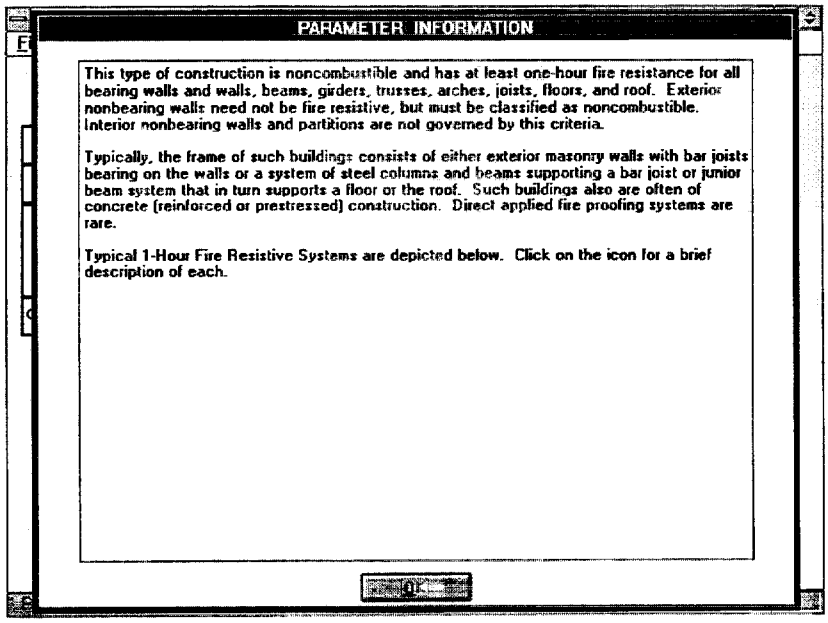

FIGURE 19 CONSTRUCTION "PARAMETER INFORMATION"

4.2.4 Safety Parameter 2, Segregation of Hazards

The next parameter is the "Segregation of Hazards" parameter. An example of this screen is shown in Figure 20. The functionality of this screen is identical to that of the "Construction Parameter" screen, with the exception of the "CALCULATE" button. Furthermore, clicking any of the "PARAMETER STATUS" buttons will provide the user with an example of the selected condition.

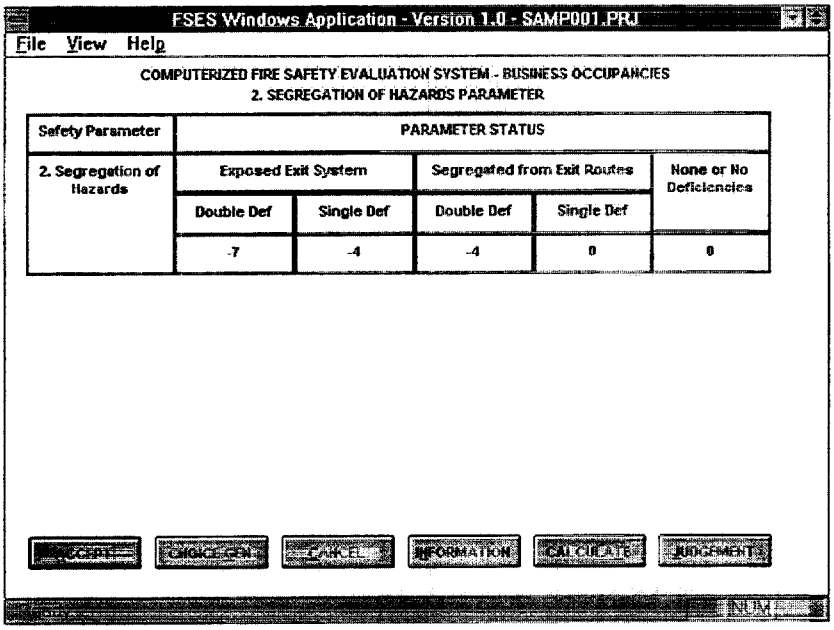

FIGURE 20 SAFETY PARAMETER SEGREGATION OF HAZARDS SCREEN

The "CALCULATE" button performs two calculations. The first calculation determines if there is the potential for a structurally endangering fire in the compartment. The second calculation determines if there is the potential for flashover to occur. Selecting the "CALCULATE" button brings up the screen shown in Figure 21. The values displayed are the default values, and may be changed by clicking the mouse on the appropriate box and entering the desired values.

There are seven buttons at the bottom of the screen shown in Figure 21. Two of the buttons, "CANCEL" and "HELP", have already been discussed. The buttons labeled "7-5.2.1" and "7-5.2.4.3" display the NFPA 101A code sections 7-5.2.1 and 7-5.2.4.3, respectively. The "VIEW GRAPH" button displays Figure 7-5.2.2(a) of NFPA 101A, a graph of the approximate fire severity based on the floor area and the total fire load. This is shown in Figure 22. The "FLASHOVER" button performs the flashover calculation mentioned earlier.

Selecting the "OK" button performs the fire severity calculation. If the data is not within reasonable limits or a number is not entered, an error message will flash and the user will be returned to the same screen. If the conditions are found to be structurally endangering, the program will return to the "Segregation of Hazards" screen and highlight the appropriate box. If it is not found to be structurally endangering, the program will alert the user and enter the "Flashover Calculation" screen, shown in Figure 23. As with the fire severity calculation box, the flashover calculation box contains default values which may be changed. The default values do not cause flashover. The "BURN RATE" button displays a list of peak burning rates for several common fuel packages, shown in Figure 24.

The results of the calculations for the example building result in an exposed exit system with a single deficiency (Figure 25).

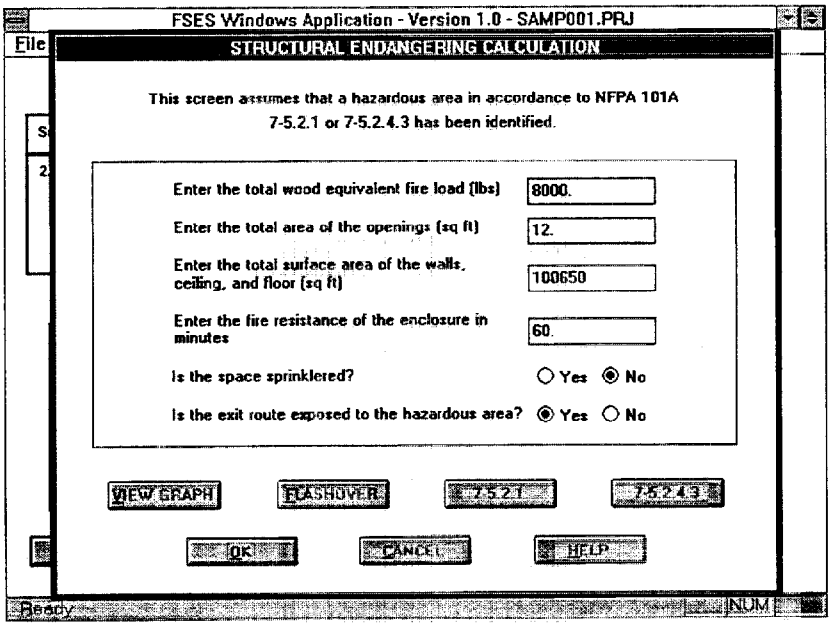

FIGURE 21 "STRUCTURAL ENDANGERMENT CALCULATION" SCREEN

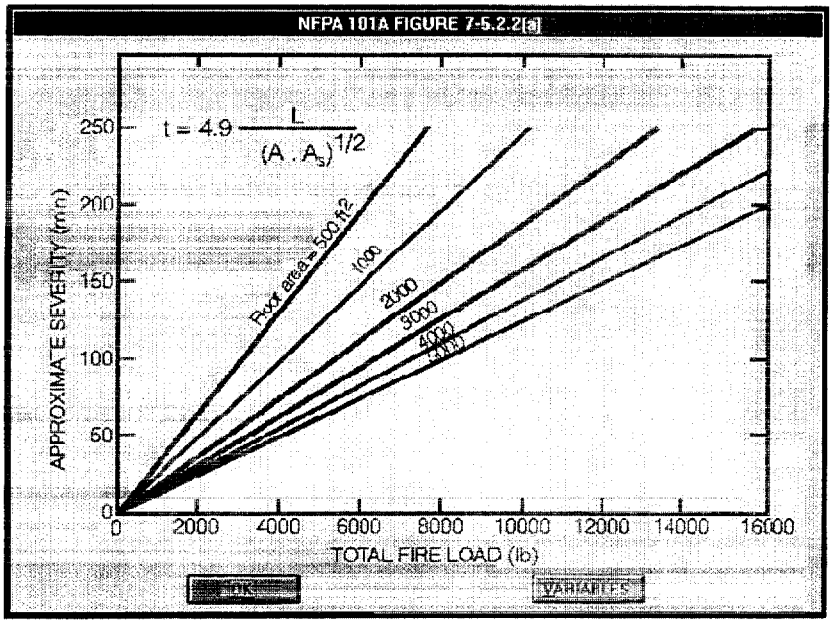

FIGURE 22 "NFPA 101A FIGURE 7-5.2.2(A)"

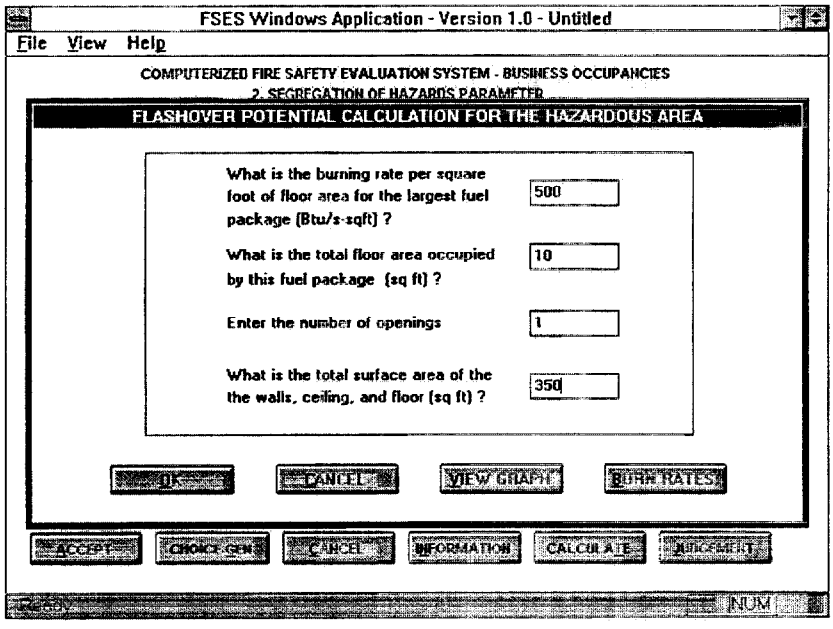

FIGURE 23 "FLASHOVER POTENTIAL CALCULATION" BOX

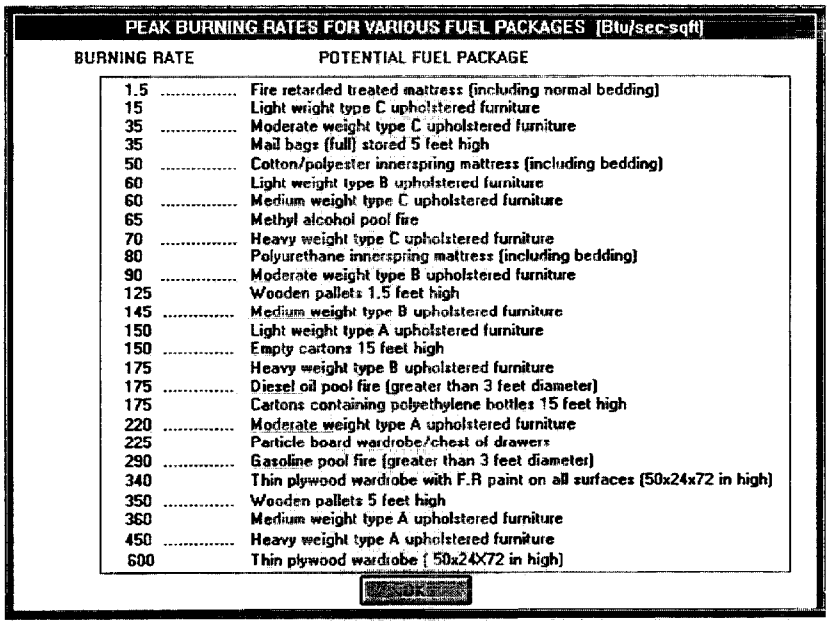

FIGURE 24 "PEAK BURNING RATES FOR VARIOUS FUEL PACKAGES" BOX

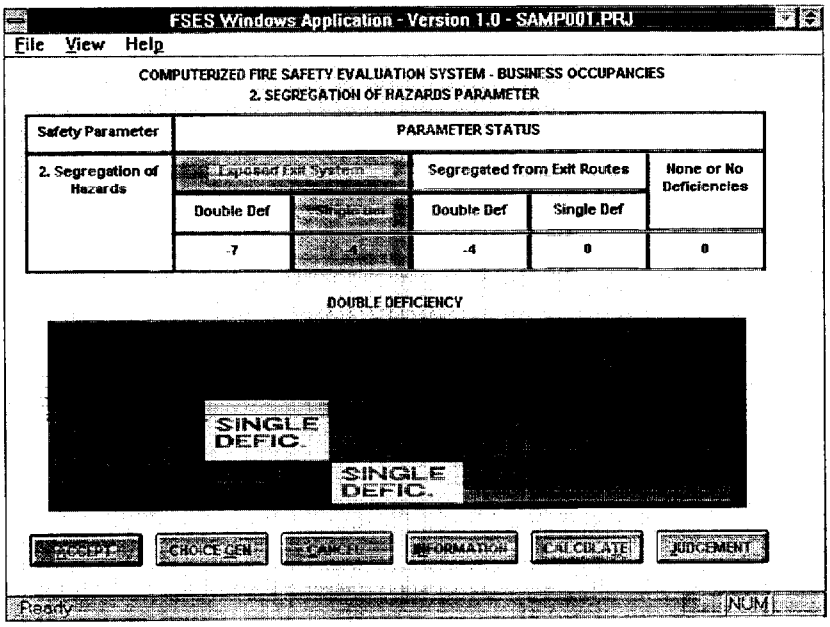

FIGURE 25 CALCULATED SELECTION IN "SEGREGATION OF HAZARDS" PARAMETER SCREEN

Choosing the "ACCEPT" button selects the score and returns to the "Main Parameter Screen".

4.2.5 Safety Parameter 3, Vertical Openings

The next parameter is vertical openings. Vertical openings include exit stairways, ramps, and any other vertical exits, pipe shafts, ventilation shafts, duct penetrations, laundry chutes, and incinerator chutes. The score for enclosed vertical openings is based on the fire resistance of the enclosure, whereas the score for unenclosed vertical opening protection depends on the number of stories connected by the vertical opening.

As shown in Figure 26, there are two main types of vertical openings: open and enclosed. A vertical opening is considered open if it is: (1) unenclosed; (2) enclosed but has doorways (or similar portals) that are without doors; (3) enclosed but has unprotected openings other than doorways; and (4) enclosed with cloth, paper, or similar materials without any sustained fire-stopping capabilities. If the opening is determined to be open then the number of connected floors must be selected. However, if the opening is classified as enclosed then the rating of the enclosure must be selected.

Unlike the previous two safety parameter screens, the information text is displayed below the green boxes. As with all of the parameter screens, the "CANCEL" button returns the user to the "Main Parameter" screen with no selection (eliminating any selections made) and the "ACCEPT" button selects the score. The score may also be selected by double-clicking on that score.

In the example, the vertical openings are enclosed and have a fire resistance rating between 30 minutes and 1 hour.

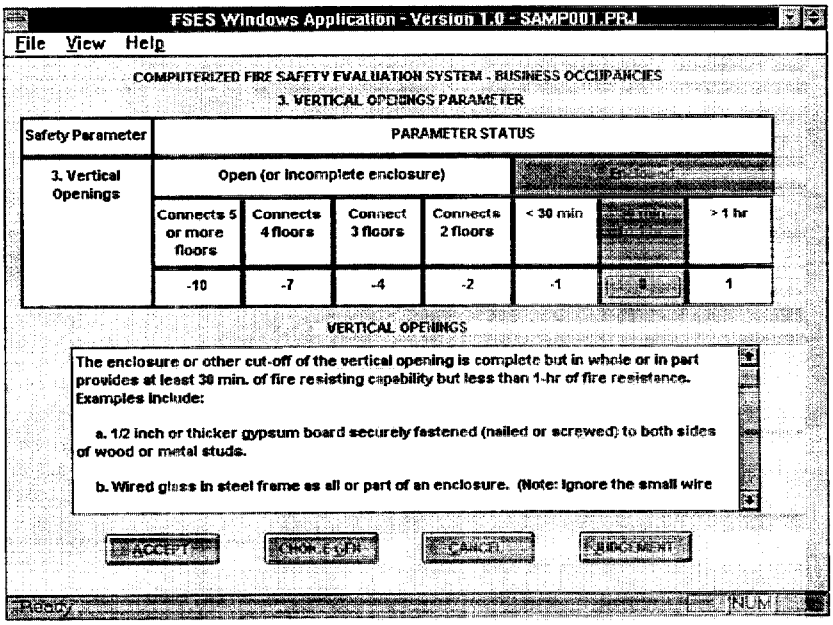

FIGURE 26 SAFETY PARAMETER VERTICAL OPENINGS SCREEN

4.2.6 Safety Parameter 4, Sprinklers

The "Sprinklers Parameter" screen, shown in Figure 27, allows the user to select the level of automatic sprinkler protection. The user can select one of the following: (1) none; (2) corridors only; (3) all but corridors and lobbies; and (4) total building. For selections (3) and (4) the user can also indicate either standard or fast response sprinklers. In all instances the sprinkler system must be in accordance with the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*. Furthermore, to receive credit for protection, the sprinkler system must be equipped with an automatic alarm initiating device that activates the building manual fire alarm system or otherwise sounds an alarm sufficiently audible to be heard in all occupied areas.

The "DISCUSSION" button, a feature only included in this screen, provides the user with a detailed discussion of the sprinkler parameter.

As mentioned earlier, the example building is not sprinklered.

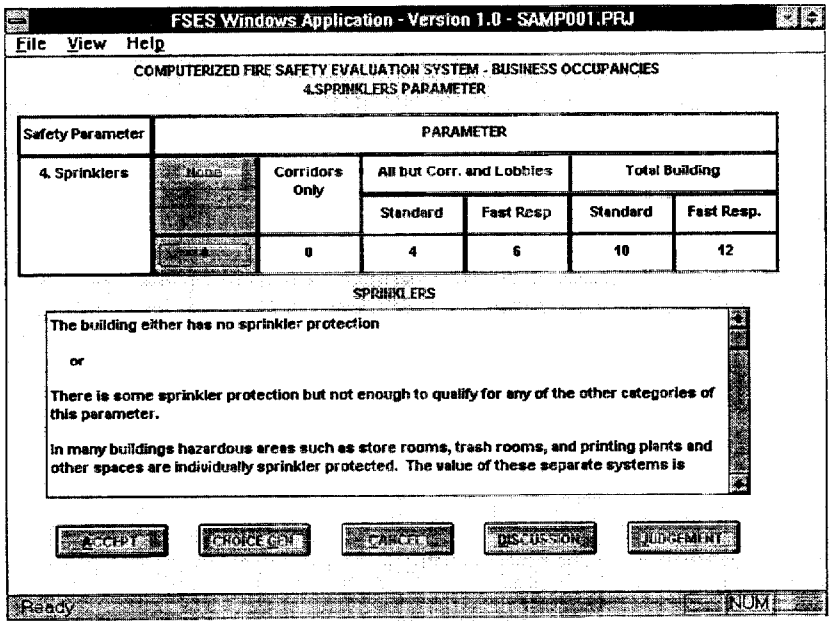

FIGURE 27 SAFETY PARAMETER SPRINKLERS SCREEN

4.2.7 Safety Parameter 5, Fire Alarm System

The "Fire Alarm Systems Parameter" screen, shown in Figure 28, allows the user to select the type of fire alarm system. If a fire alarm system exists or is planned, the user must indicate if the system automatically transmits a signal to the fire department that is committed to serve the area in which the building is located through a direct connection, an approved central station, or other acceptable means. The user must also indicate if the system includes voice communication for occupant notification and instruction.

In the example, the building has no fire alarm system. However, a score of -2 or 0 is possible. Three questions pertaining to the egress capacity must be asked to determine which score should be selected. These questions are shown in Figure 29.

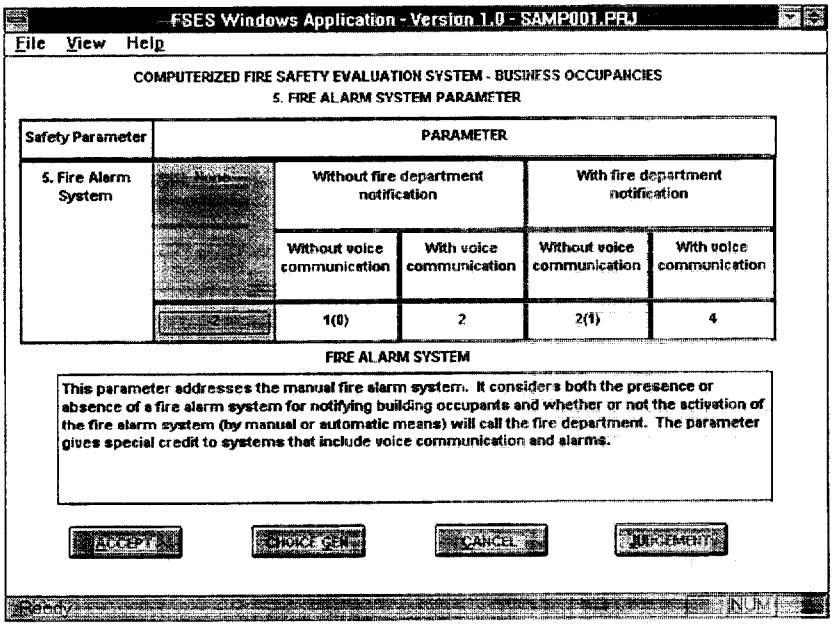

FIGURE 28 SAFETY PARAMETER FIRE ALARM SYSTEM SCREEN

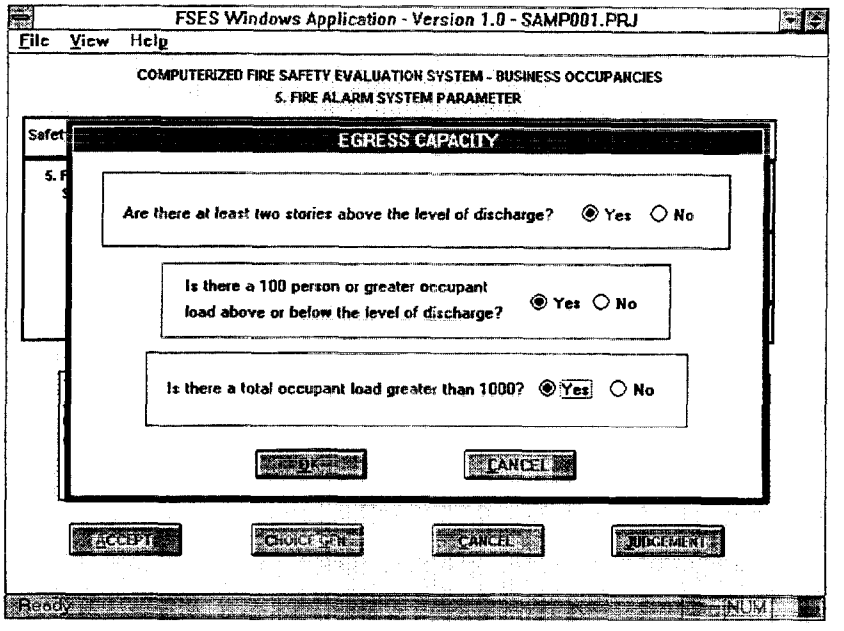

FIGURE 29 "EGRESS CAPACITY" QUESTION BOX

4.2.8 Safety Parameter 6, Smoke Detection

The "Smoke Detection Parameter" screen, shown in Figure 30, allows the user to input the coverage of the smoke detection system, including: (1) none; (2) corridor; (3) rooms; and (4) total building (zone). In all cases, detectors must be installed in accordance with NFPA 72, *National Fire Alarm Code*. It is important to note that "no credit is given for heat detectors in habitable space." Furthermore, only those detectors that will sound an alarm throughout the building upon activation are to be considered in this parameter. In order to receive credit for either corridor or room detection, detectors must be installed in every corridor or room, respectively.

In the example, the building is provided with detectors throughout the building.

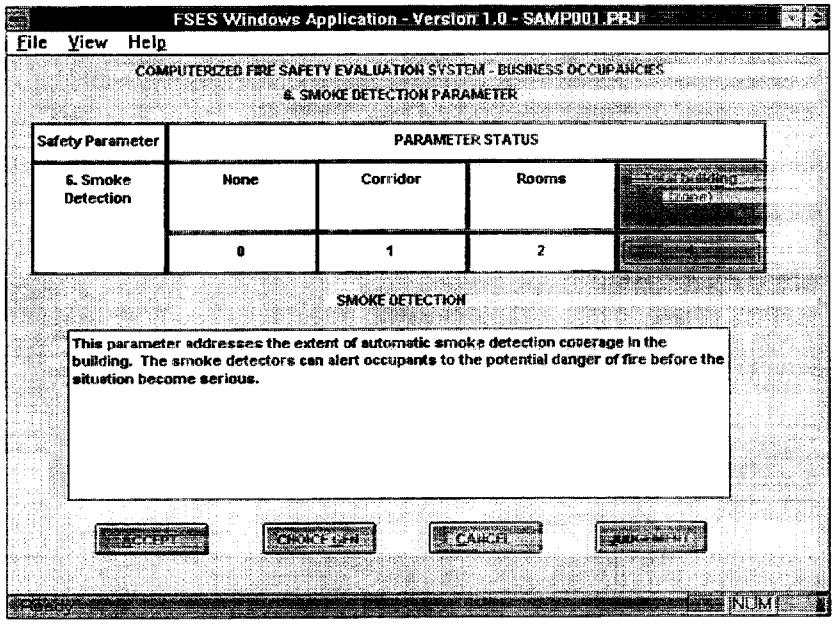

FIGURE 30 SAFETY PARAMETER SMOKE DETECTION SCREEN

4.2.9 Safety Parameter 7, Interior Finish

The "Interior Finish Parameter" screen, shown in Figure 31, allows the user to input the flame spread rating of the ceiling and wall materials. The flame spread ratings used in FSES are based on NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. The FSES does not include provisions for materials with flame spread ratings greater than 200 or for any finish not measured in accordance with NFPA 255. These "materials include foamed plastics, asphalt-impregnated paper, materials that melt, drip, or delaminate, or those capable of inducing extreme rates of fire growth and rapid flashover." In these cases, the FSES should not be used.

The flame spread ratings may be reduced for sprinklered buildings. "Any interior finish having a flame spread of 75 or less that is protected by automatic sprinklers is evaluated as having a flame spread not exceeding 25. Any interior finish having a flame spread of more than 75 but not more than 200 that is protected by automatic sprinklers is evaluated as having a flame spread not exceeding 75. It is important to note that these reductions are performed by the software; the actual flame spread ratings should be input not the reduced values.

In the example, the building has a flame spread rating greater than 25 but less than 75.

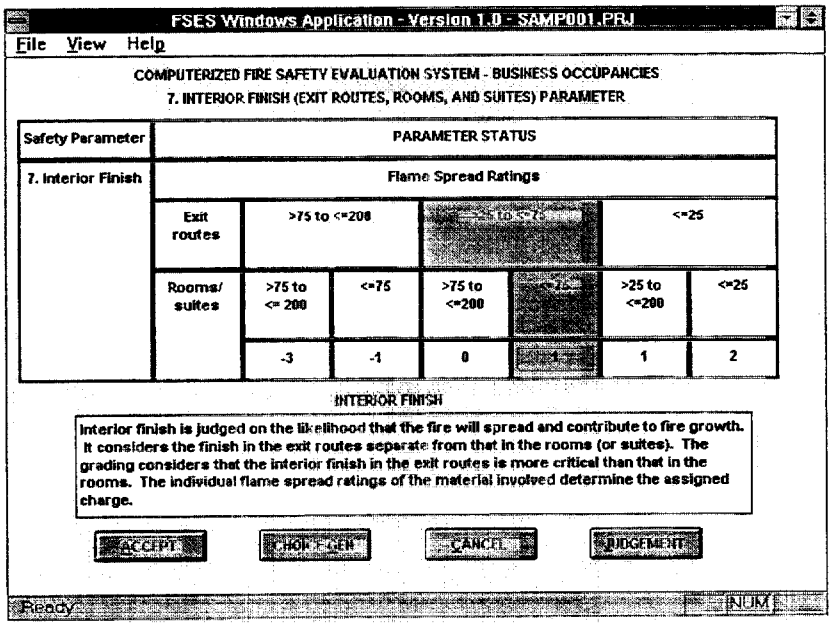

FIGURE 31 SAFETY PARAMETER INTERIOR FINISH SCREEN

4.2.10 Safety Parameter 8, Smoke Control

The "Smoke Control Parameter" screen, shown in Figure 32, allows the user to select the type of smoke control system used. The user may select (1) none; (2) passive, or (3) active. If "there are no smoke barriers or horizontal exits to a separated fire/smoke zone on the floor and no mechanically assisted smoke control system serving the floor," the user would select "none." A passive smoke control system "consists of continuous vertical membranes designed to restrict the movement of smoke." An active smoke control system "has a tested and accepted smoke control system that obstructs the leakage of smoke between compartments or zones."

The example consists of a passive smoke control system.

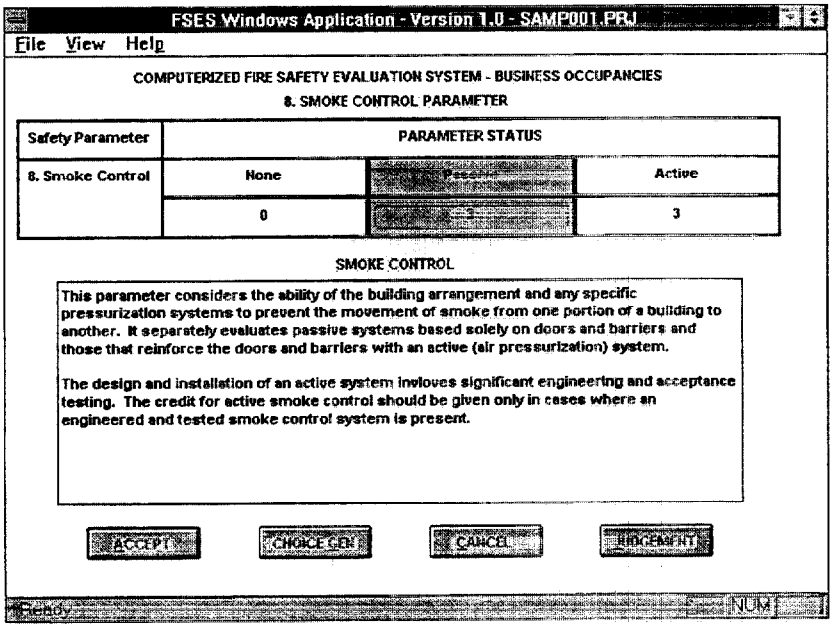

FIGURE 32 SAFETY PARAMETER SMOKE CONTROL SCREEN

4.2.11 Safety Parameter 9, Exit Access Parameter

The "Exit Access Parameter" screen, shown in Figure 33, allows the user to input information relative to dead-end corridors and travel distance. If the maximum dead-end is greater than 50 ft., then one of two columns under the "Max. dead-ends:" heading must be selected. These two columns indicate the maximum length of the dead-end corridor. However, if the maximum dead-end is less than 50 ft., then the selection is based on the maximum travel distance.

Note that if the maximum dead-end distance is greater than 100 ft., "a separate analysis must be conducted to evaluate the flashover potential of any space that could block egress from the dead-end and to determine the potential rate of smoke filling of the egress system involved. If the safe time is shorter than the expected egress time, the evaluation should be discontinued unless a corrective action is specified." Also note that the 50 ft. dead-end limit only applies to existing buildings and new fully sprinklered buildings. A limit of 20 ft. is used for all other new buildings. If the building is fully sprinklered then the maximum travel distance increases from 200 to 300 ft.

The example building has no dead-ends in excess of the 50 ft. limit and a maximum travel distance between 50 and 100 feet.

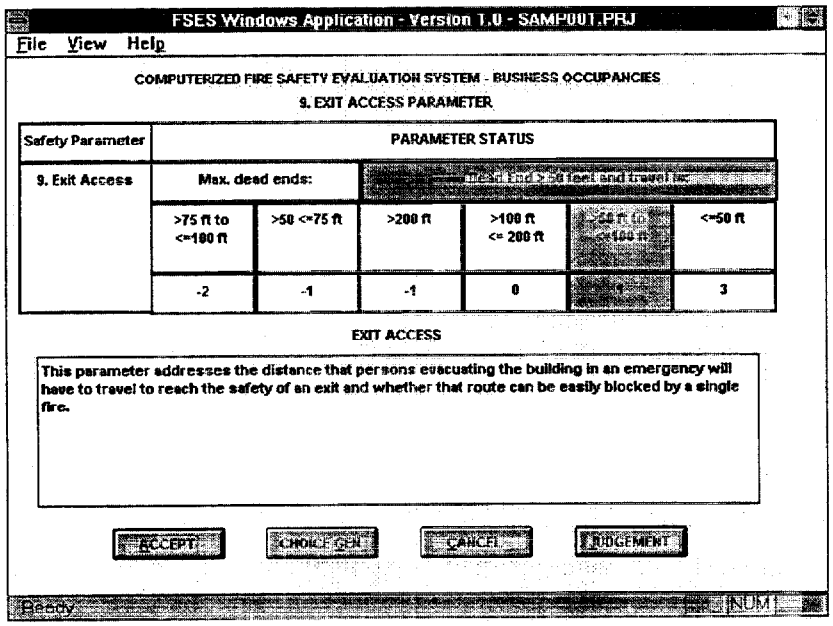

FIGURE 33 SAFETY PARAMETER EXIT ACCESS SCREEN

4.2.12 Safety Parameter 10, Exit System

The "Exit System Parameter" screen, shown in Figure 34, allows the user to input information relative to the paths of travel from a room to the outside. One of the following five options must be selected: (1) single; (2) multiple routes - deficient; (3) multiple routes - not deficient; (4) multiple routes - smokeproof enclosures; and (5) multiple routes - direct exits.

"A single route exists where occupants on any floor do not have either a direct exit or multiple routes. Multiple routes exist where the occupants on a floor have a choice of two separate means of egress to the outside. An exit route is considered deficient if it fails to meet any of the applicable criteria of NFPA 101, *Life Safety Code*, including capacity. Any system with a common path of travel in excess of that permitted by NFPA 101 should also be considered deficient." To receive credit for smokeproof enclosures all exit stairs shall meet the requirements for smokeproof enclosures. To be credited for direct exits, each room must contain a door that either opens to the exterior at grade level or to an exterior balcony with direct access to an exterior exit.

The exit systems for the example are multiple routes - not deficient.

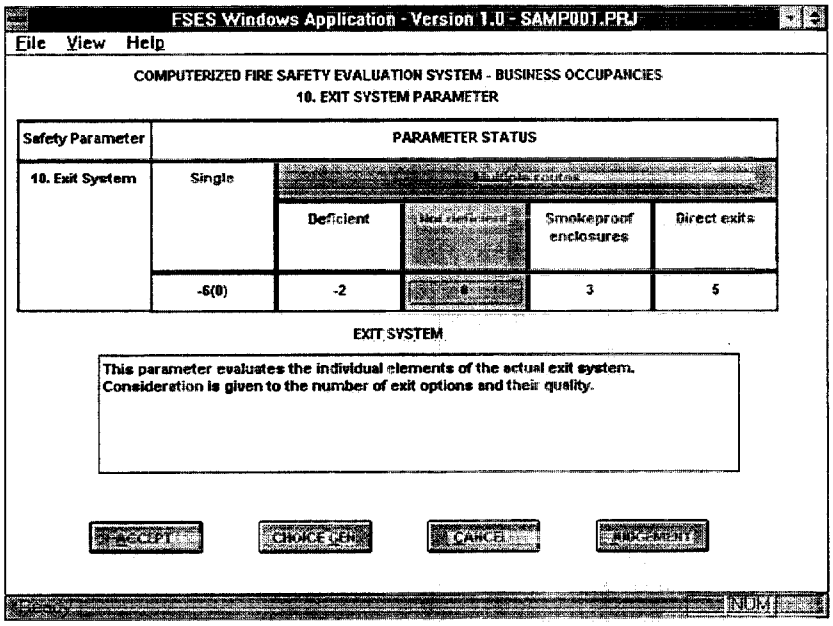

FIGURE 34 SAFETY PARAMETER EXIT SYSTEM SCREEN

4.2.13 Safety Parameter 11, Corridor/Room Separation

The "Corridor/Room Separation" screen, shown in Figure 35, assigns values based on the quality of the separations between the rooms and the corridors. The separation is considered incomplete if the wall has any unprotected openings between the floor or ceiling. If there are openings above the ceiling level, the separation is considered complete provided the ceiling is a completed membrane. If the separation meets the criteria above, then it is considered complete. The complete separations are further divided based on fire resistance and the presence/absence of automatically closing doors. If the compartment is not subdivided then there is no separation.

In the example the separation is considered incomplete.

Selection of incomplete brings up the screen shown in Figure 36. This screen prompts the user for the corridor safe time and selects a score based on this selection. If the corridor safe time is not known, the user may select the "CALCULATE" button and enter the requested information (Figure 37). The program will then calculate the corridor safe time. Figure 38 shows an incomplete separation selection with a score of "-2", implying the corridor safe time is between 4 and 8 minutes.

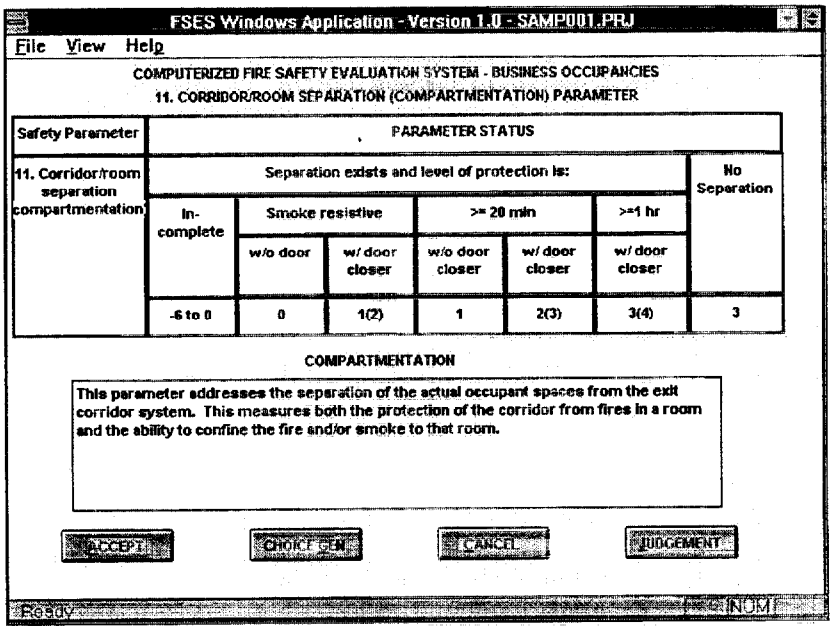

FIGURE 35 SAFETY PARAMETER CORRIDOR/ROOM SEPARATION SCREEN

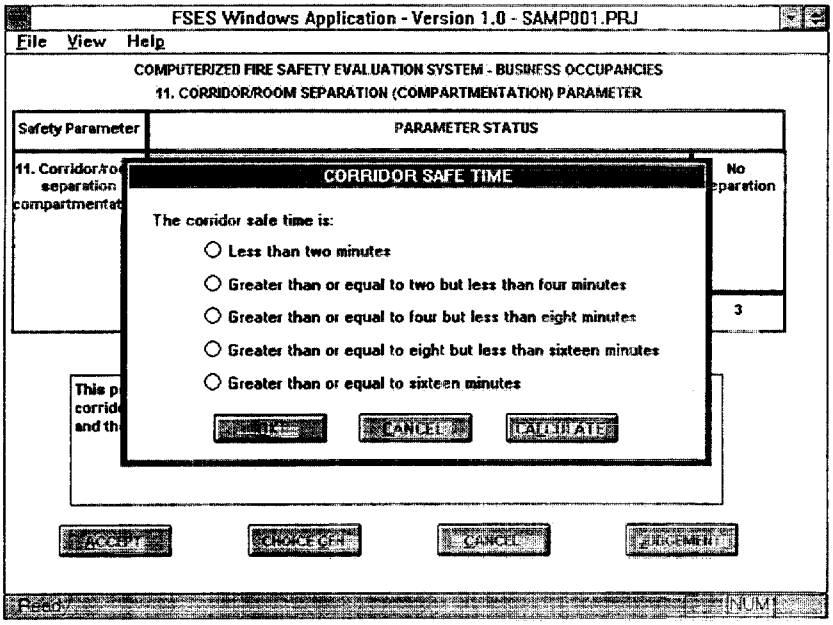

FIGURE 36 CLICKING ON INCOMPLETE SEPARATION

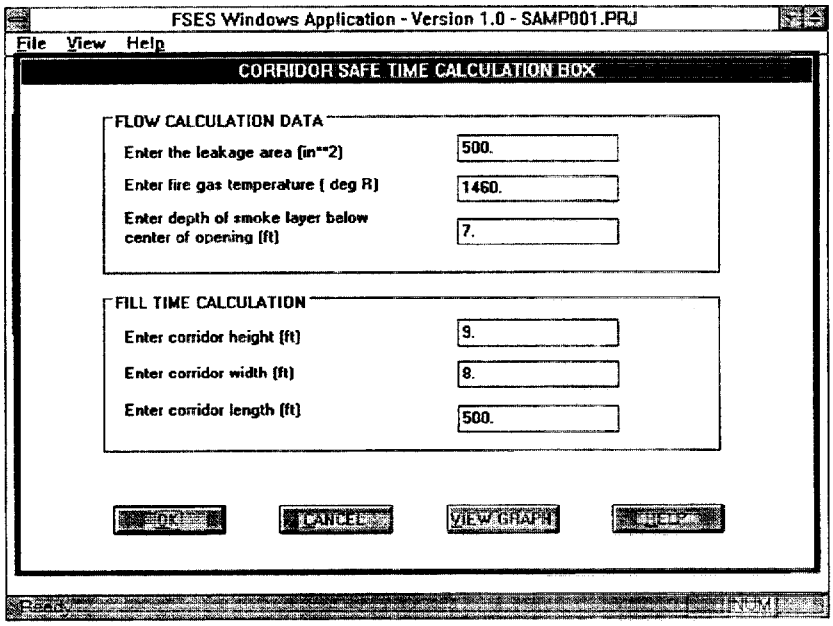

FIGURE 37 "CORRIDOR SAFE TIME CALCULATION" BOX

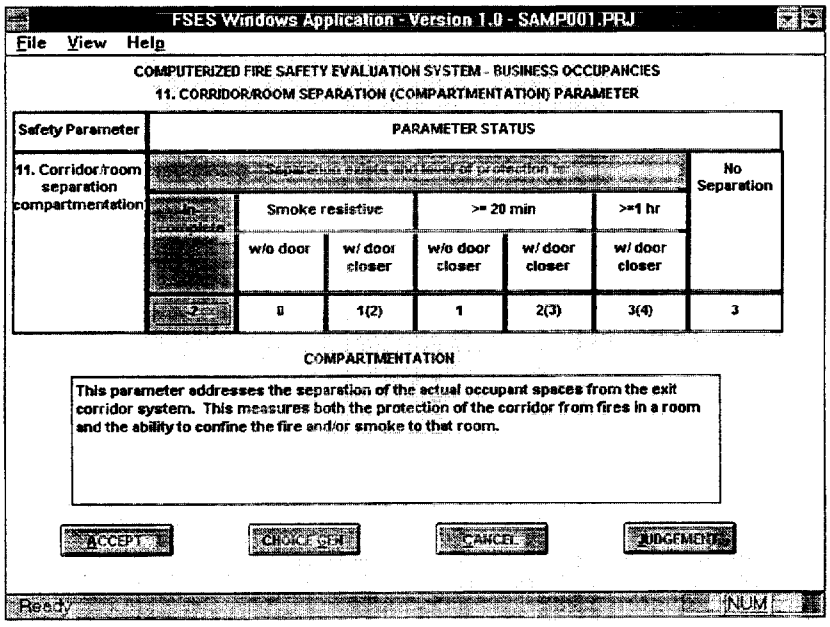

FIGURE 38 SCORE SELECTION IN "CORRIDOR/ROOM SEPARATION PARAMETER" SCREEN

4.2.14 Safety Parameter 12, Occupant Emergency Program

The last parameter screen is the Occupancy Emergency Program. This is shown in Figure 39, with a selection of no occupancy emergency program.

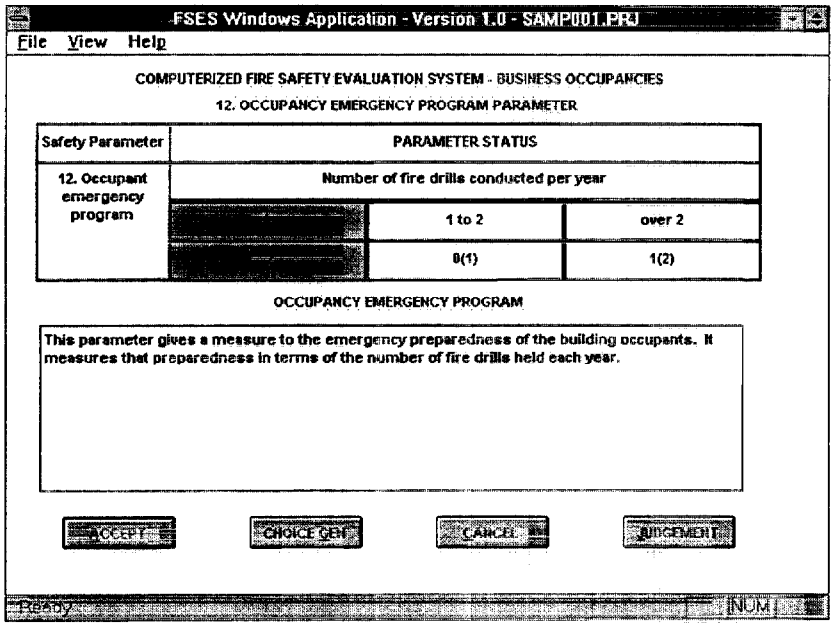

FIGURE 39 SAFETY PARAMETER OCCUPANT EMERGENCY PROGRAM SCREEN

4.2.15 Changing Parameter Selections

Figure 40 shows the "Main Parameter" screen after all the parameters have been addressed. There are three features to note. First, the score for the building is now displayed on the lower left section of the screen. The three boxes represent the score for (from left to right) fire control, egress, and general. The general score is the straight summation of all the parameter scores. Egress and fire control omit some parameter scores and use only half of the value for some, as required by NFPA 101A. Second, a correctly scored or addressed parameter has an 'x' placed by the left of it, and third, a brief description of the parameter selection is displayed to the right.

Clicking on "NEXT SCREEN" displays the screen shown in Figure 41. This screen closely resembles Table 7-2 in NFPA 101A. The screen summarizes the scores for each of fire control, egress, and general. The required score and the difference is also displayed. If the particular score category does not meet the mandatory requirements, the caption of the category appears red. In the case of the example, only egress fails to meet the criteria.

There are several functional features with this screen. The selections for each parameter under the general parameter category may be single or double-clicked. A double-click will send the user to the parameter screen for the parameter score that was clicked. This will allow the user to alter the selection of the parameter. The program then returns to the screen shown in Figure 41. A single click will allow the user to *temporarily* change the score in the evaluation sheet in order to observe the effect on the three categories. Figure 42 shows a typical screen of this type. Clicking on "BACK SCREEN" or double-clicking on any of the green boxes under the general category will erase these values. A warning box is displayed when this is so. It should be noted that changing the value of a parameter in this manner is restricted in range to the maximum and minimum values for the parameter under scrutiny. Attempts to exceed this range are not permitted.

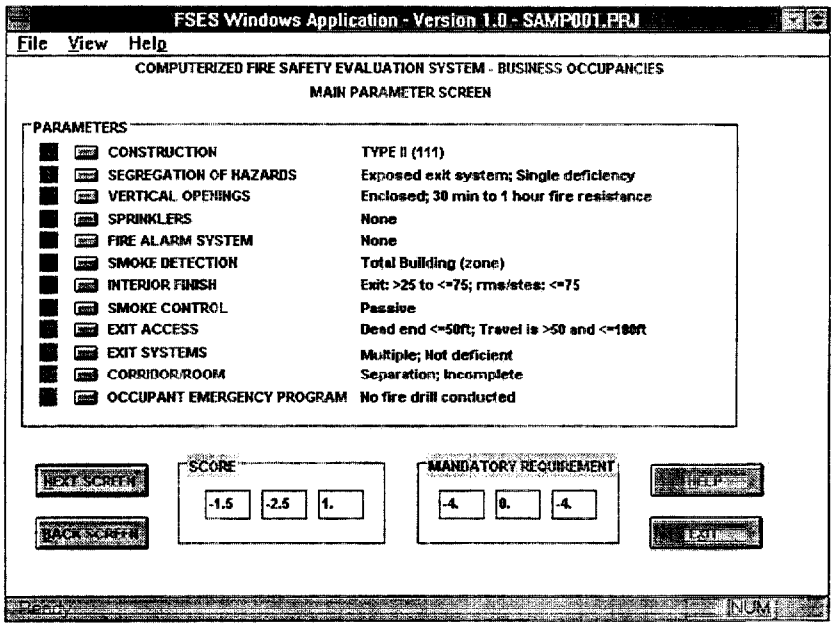

FIGURE 40 COMPLETED "MAIN PARAMETER SCREEN" SCREEN

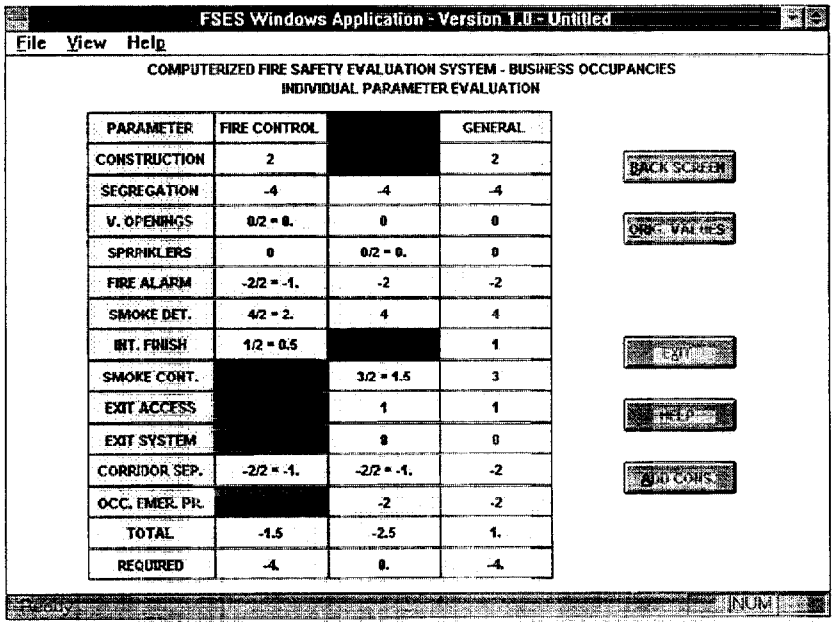

FIGURE 41 "INDIVIDUAL PARAMETER EVALUATION" SCREEN

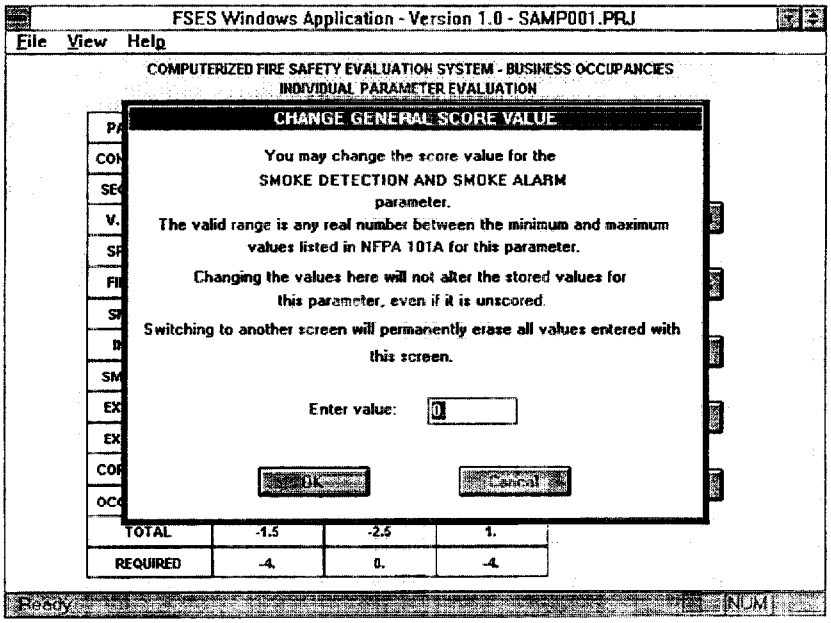

FIGURE 42 TEMPORARILY CHANGING A PARAMETER SCORE

There is one important feature on the "Individual Parameter Evaluation" screen that needs to be noted. Currently, this is the only screen that permits printing. Printing may be performed by choosing "File" on the Main Menu and selecting the "Print..." submenu option. The print features will be examined in further detail in the next section. Examples the FSES printouts are provided in Appendix A.

In this example, the egress category fails to meet the mandatory requirement. The "Individual Parameter" screen permits the values to be altered for specific parameters to observe the impact on the evaluation result. In this example, the egress requirement can be met if fast response sprinklers are added to all spaces except the corridors. The updated screen is shown in Figure 43. Appendix A contains a printout of both the initial example and the updated example.

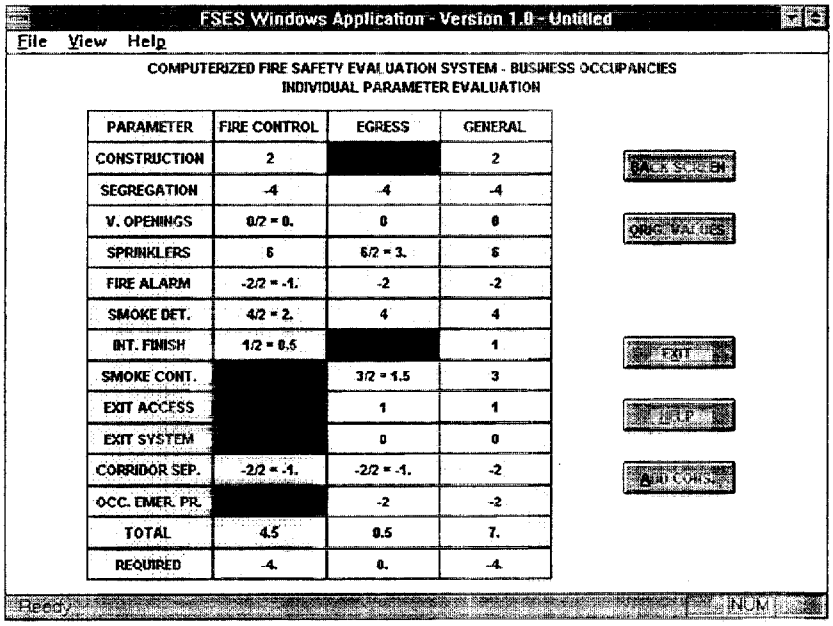

FIGURE 43 UPDATING THE "INDIVIDUAL PARAMETER EVALUATION" SCREEN

4.4.16 Additional Considerations

The last section of NFPA 101A, Chapter 7 that needs to be addressed are the additional considerations, listed in NFPA 101A Table 7-5, "Facility Fire Safety Requirements Worksheet". The six considerations listed in the Table are essentially beyond the scope of the code, but should be addressed. The evaluation cannot pass or fail a building based on the response to these questions, hence they are an optional feature in this computer program. They may be accessed by selecting the grey button labeled "ADD CONS." in the "Individual Parameter Evaluation" screen shown in Figure 41. Two screens, each prompting for the status of three considerations, will follow in sequence. These are shown in Figures 44 and 45. Clicking on the "OK" in both cases enters the data and clicking on the "CANCEL" will erase the data. Note that clicking the "CANCEL" on the second screen will erase all of the consideration data, including that which was entered on the first screen (Figure 44). Also, the sixth consideration (standpipes provided in new high-rise buildings) will be enabled only if the building has been evaluated as a new structure greater than 150 feet.

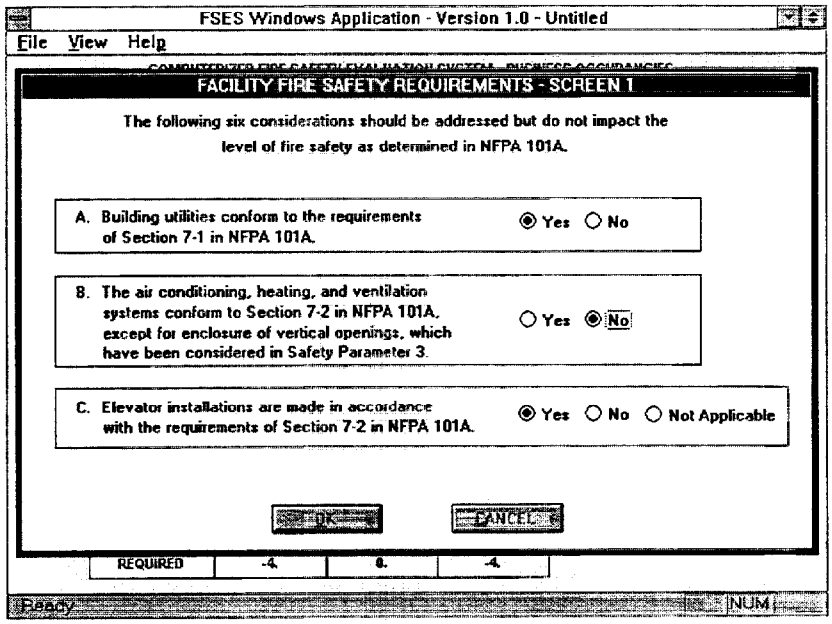

FIGURE 44 ADDITIONAL CONSIDERATIONS A-C

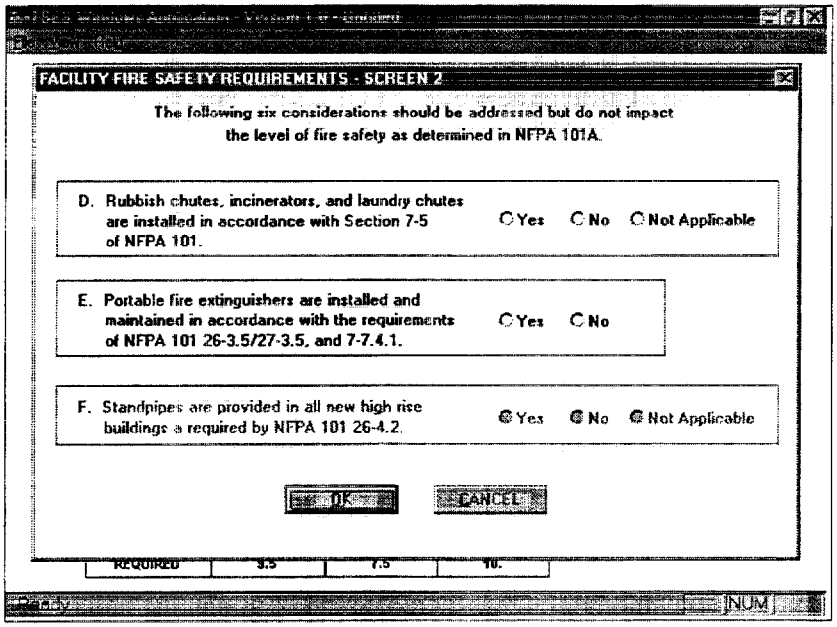

FIGURE 45 ADDITIONAL CONSIDERATION D-F

5.0 Main Menu Operation and Other Program Features

In addition to running the program as illustrated in the example of section 4.2, there are several additional features. The Main Menu is the standard Windows method of performing file input and output, controlling custom user options, and making printouts. Above the Main Menu is the System Menu. This contains a colored bar, the application title ("FSES Windows™ Application - Version 1.0 - *filename*", and three small grey squares that allow the user to switch between applications, exit, minimize the run, and change the size of the window. This section will describe the functionality of the Main Menu in the FSES program and will also explain the use of the "JUDGEMENT" buttons. Because the System Menu is with few exceptions identical in all Windows™ application programs and is an inherent window characteristic, its use is not discussed in this section.

5.1 Main Menu

The Main Menu for the computerized FSES for business occupancies currently contains three menu options: "File", "View", and "Help". These options appear on every screen with the exception of some "Information" screens, as can be observed in the example of Section 4.2. The Main Menu may be accessed by depressing the "Alt" key, whereby the "File" option is darkened. Pressing the enter key or any underlined letter will list the options under the respective menu items. The "Esc" key returns the user back to the application. Figure 46 shows the options under the "File" menu. As seen in the figure, there are nine sub-items: "New...", "Open", "Close", "Save", "Save As", "Print", "Print Preview", "Print Setup", and "Exit". These options may be grouped into three categories: file input/output, printing support, and closing the application down.

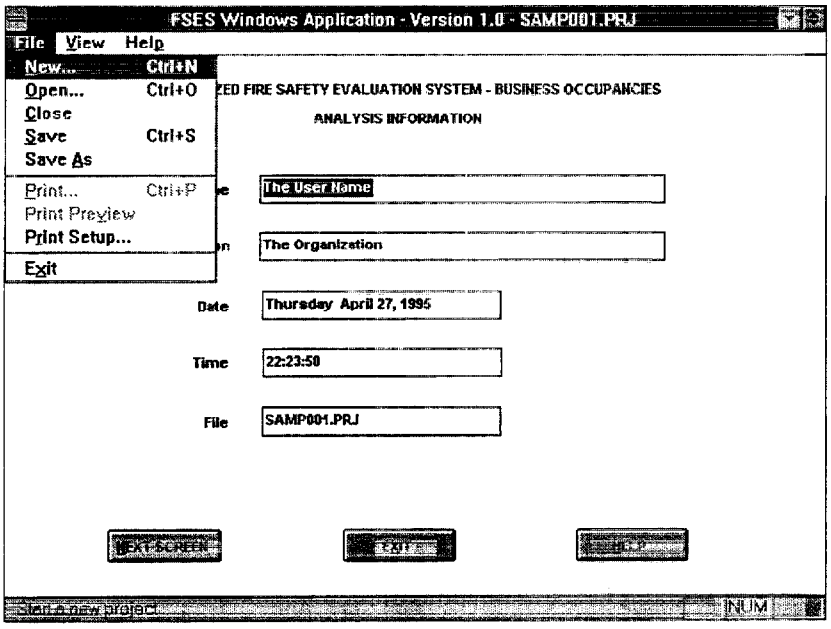

FIGURE 46 "FILE" MENU OPTIONS

Four of the sub-menu items are followed by three dots (...). This indicates that the user will be prompted for more information, as is standard Windows procedure. To the right of several of the items are what are termed "Hot Keys". Instead of proceeding through the Main Menu, these items may be accessed at any time by depressing the keys indicated ("Ctrl + N" will activate the "New" sub-item, for instance).

5.1.1 File Operations

There are four file operations: "New", "Open", "Save", and "SaveAs". "New" will begin a new project. If the current analysis is in an unsaved state, then the user will be prompted as to if the current analysis should be saved, not saved, or if the "New" operation should be canceled. This is also a standard Windows practice. The "Open" sub-item allows the user to retrieve a previously saved analysis. The default analysis extension is .PRJ, and the open procedure will list all files with the .PRJ extension, as shown in Figure 47.

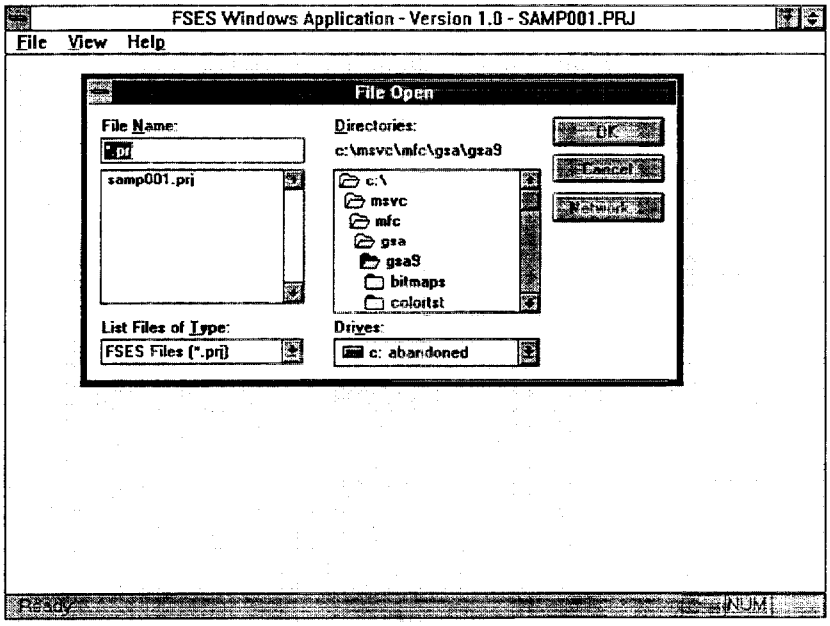

FIGURE 47 "FILE OPEN" DIALOG BOX

Included on the installation disk is the file "SAMP001.PRJ", which is identical to the example of Section 4.2. This file may be loaded by selecting it through the "File Open" screen. It should be noted that any extension (or none at all) may be used, and that .PRJ is merely the default extension that the "File Open" box searches for.

The last two sub-items, "Save" and "Save As" allow one to save the current work and to save it as a different name. The "Save As" item brings up another screen similar to Figure 45 that allows one to enter in the desired name.

5.1.2 Printing Support

The three printing sub-items, "Print", "Print Preview", "Print Setup", allow the user to select the printer, view the output page, and to actually print the page. "Print Setup" screen including the options available is determined by the particular printer driver that is loaded and will consequently vary from computer to computer. It is identical to the screen that is observed when running the printer setup routine generally found in the "Control Panel" within the group "Main" in the "Program Manager". It is not described here due to the wide variation. The remaining two options will always be inactive unless in the last screen - "Individual Parameter Evaluation" shown in Figure 41. This is to ensure that the user has proceeded through the bulk of the program before attempting a printout. The print preview option permits viewing the page before it has been printed. Before previewing a print option, an intermediary screen (Figure 48) is displayed requesting the user to check the information intended for printing. The user may select either a summary of each parameter selection and score ("General Score Summary"), the status of the additional considerations ("Additional Considerations", only when they have been answered) or both. After selecting the information, the pages will be previewed as shown in Figure 49. The screen is scarcely legible in this document to the reduced nature of the screen capture. It is intended to show the reader that the page may be observed in its printed out state prior to actually printing it out.

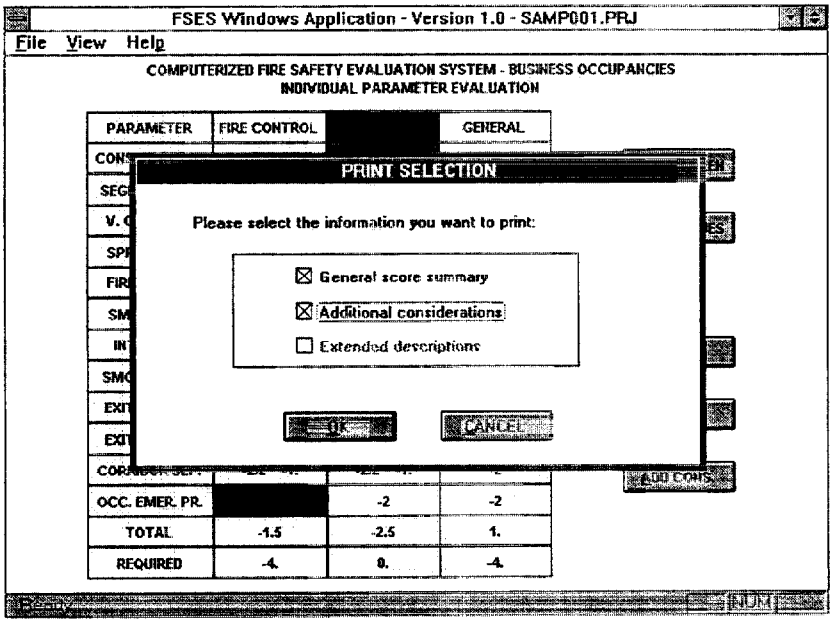

FIGURE 48 PRINT INFORMATION SELECTION BOX

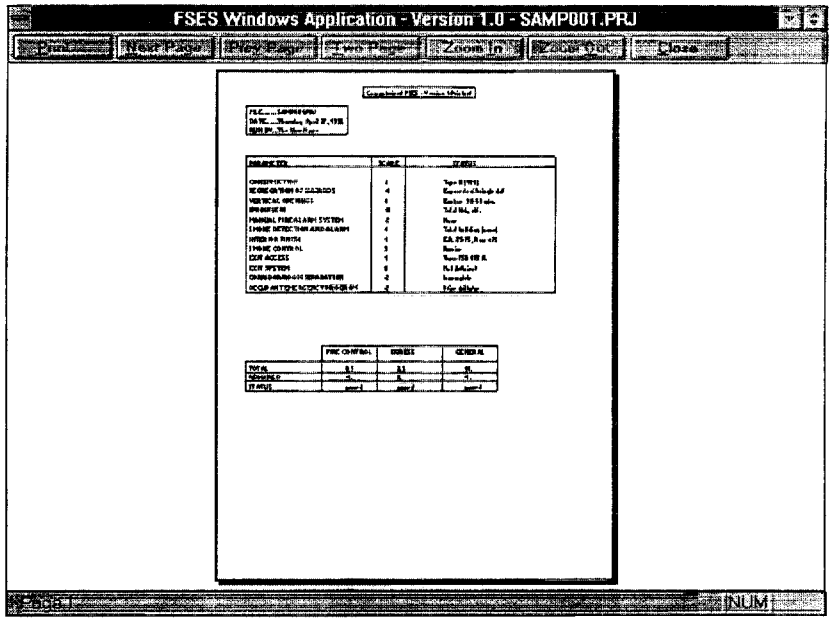

FIGURE 49 TYPICAL PRINT VIEW SCREEN

This screen permits one to "Zoom In" and "Zoom Out" when applicable, "Close" which returns to the "File" menu, and to "Print" to the printer. This screen is a standard Windows procedure and may be recognized from other applications. Finally, the "Print" option located under the file submenu allows one to print directly to an attached printer. The standard print options screen is first displayed, as seen in Figure 50 which allows the user to specify the number of pages, the page orientation and so on. Examples of the output are listed in Appendix A.

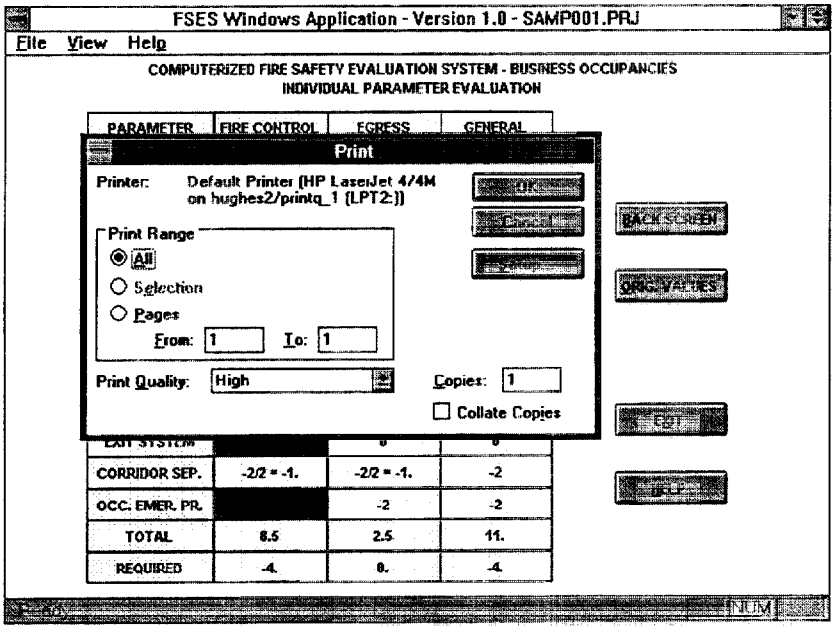

FIGURE 50 "PRINT OPTIONS" DIALOG BOX

5.1.3 Exit and Other Main Menu Items

The "Exit" option under the "File" menu item allows the user to exit in the same manner as using the "EXIT" buttons throughout the screens.

The last two items on the "Main Menu" are "View" and "Help". The view option currently only toggles the status bar at the bottom of the screen on and off. The help option will display the application name, version, and date of last major updates and resembles Figure 9 in appearance.

Appendix A

This Appendix contains two printouts of the example described in Section 4.2: The example with a failing score in the egress evaluation (Figure A-1) and the modified example with all three evaluation categories passing (Figure A-2). Figure A-3 is a typical printout of the "Addtional Considerations" information.

Computerized FSES - Version 1.0 Printout

FILE.....None Specified
DATE.....Monday July 01, 1996
RUN BY...None Specified

PARAMETER	SCORE	STATUS
CONSTRUCTION	2	Type II (111)
SEGREGATION OF HAZARDS	-4	Exposed exit-single def
VERTICAL OPENINGS	0	Enclose 30-60 min.
SPRINKLERS	0	None
MANUAL FIRE ALARM SYSTEM	-2	None
SMOKE DETECTION AND ALARM	4	Total building (zone)
INTERIOR FINISH	1	E.R. 25-75, Rms <75
SMOKE CONTROL	3	Passive
EXIT ACCESS	1	Travel 50-100 ft.
EXIT SYSTEM	0	Not deficient
CORRIDOR/ROOM SEPARATION	-2	Incomplete
OCCUPANT EMERGENCY PROGRAM	-2	0 fire drills/yr

	FIRE CONTROL	EGRESS	GENERAL
TOTAL	-1.5	-2.5	1.
REQUIRED	-4.	0.	-4.
STATUS	passed	failed	passed

An example with a failing score in the Egress Evaluation

Computerized FSES - Version 1.0 Printout

FILE.....None Specified
DATE.....Monday July 01, 1996
RUN BY...None Specified

PARAMETER	SCORE	STATUS
CONSTRUCTION	2	Type II (111)
SEGREGATION OF HAZARDS	-4	Exposed exit-single def
VERTICAL OPENINGS	0	Enclose 30-60 min.
SPRINKLERS	6	All excpt corr/lob, fst.
MANUAL FIRE ALARM SYSTEM	-2	None
SMOKE DETECTION AND ALARM	4	Total building (zone)
INTERIOR FINISH	1	E.R. 25-75, Rms <75
SMOKE CONTROL	3	Passive
EXIT ACCESS	1	Travel 50-100 ft.
EXIT SYSTEM	0	Not deficient
CORRIDOR/ROOM SEPARATION	-2	Incomplete
OCCUPANT EMERGENCY PROGRAM	-2	0 fire drills/yr

	FIRE CONTROL	EGRESS	GENERAL
TOTAL	4.5	0.5	7.
REQUIRED	-4.	0.	-4.
STATUS	passed	passed	passed

Modified example with all three evaluation categories passing

Computerized FSES - Version 1.0 Printout

FILE.....None Specified
DATE.....Monday July 01, 1996
RUN BY...None Specified

Building utilities conform to the requirements of Section 7-1.	MET
The air conditioning, heating, and ventilating systems conform to Section 7-2, except for enclosure of vertical openings, which have been considered in Safety Parameter 3 of Table 7-1.	NOT MET
Elevator installations are make in accordance with the requirements of Section 7-4.	MET
Rubbish chutes, incinerators, and laundry chutes are installed in accordance with Section 7-5.	MET
Portable fire extinguishers are installed and maintained in accordance with the requirements of 26-3.5/ 27.3.5 and 7-7.4.1.	MET
Standpipes are provided in all new high rise buildings as required by 26-4-2.	N/A

Typical printout of the "Additional Considerations" information

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This manual documents the use of a software implementation of the Fire Safety Evluation System in Chapter 7 of the National Fire Protection Association's Standard 101A, Alternate approaches to Life Safety (1995 Edition), which is copyrighted by the National Fire Protection Association.

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